POWER

ESTABLISHED 1884

ELY C. HUTCHINSON, *Editor*

VOLUME 74 SEPTEMBER 29, 1931 NUMBER 13

Confidential Information

One of the abuses to which manufacturers find themselves victims at times is best told by citing a specific case where an influential engineering company suggested that a manufacturer furnish complete specification covering construction of some special machinery upon which very few, if any, other builders had had experience. The buyer admitted ignorance of the important details of construction and said he would use the specification as a basis for bids.

The manufacturer, feeling complete confidence, furnished the information. The purchaser broadcast it almost verbatim. A machine shop, never a serious competitor and without previous experience in that special line, underbid the company whose specification had been used, and thereby secured the order and promptly went into the business.

One may say this sort of thing is not done any more, surely. But it is! And much too frequently. Some consulting engineers, as well as individual purchasers, make a practice of calling on the manufacturers for engineering studies and recommendations which are submitted at considerable expense.

The information thus secured is not infrequently incorporated in final specifications for competitive bidding.

When manufacturers furnish information to purchasers or consulting engineers they have every right to expect it will be treated confidentially in their interest and not be used as a competitive club.

EDITORIALS

Many Smoke Laws Lack Understanding

In another part of this number of *Power* a digest of existing smoke ordinances of localities within the United States and Canada is given. In the light of the present activity in the elimination or prevention of smoke, cinders, fly ash, or other objectionable stack discharge, a careful study of the tabulated data is very instructive.

Considering the large number of ordinances reported, the existing amount of inactive legislation upon the subject is striking, but not more so than the deplorable lack of intelligent and broad understanding of the rudiments of the problem exhibited by some of the legal requirements. In the interest of the people the ordinances are presumed to protect, and the smoke makers as well, education on the subject of smoke prevention is greatly needed.

Fortunately general recognition of this fact has resulted in the formation of the American Society of Mechanical Engineers' Pure Air Committee, an organization recently perfected for the express purpose of bringing about a better understanding of the smoke problem from all points of view. This body is also sponsoring the formation of a model smoke ordinance which will take into account the latest developments in the technique of smoke prevention, measurement methods and control.

That this ordinance, when completed, will fill a long felt need, is evident.

Spending Wisely To Aid Employment

It is interesting to speculate on how much would have been added to the "capital value" of Great Britain if the vast sums spent to date on the dole had been used to employ its recipients at useful work.

In the United States unemployment relief has been considered a local responsibility. Considerable sums have been and are being appropriated by the various communities and used for employment on public work.

This work is of two general types. One, which might be called "city maintenance," involves clean-up activities, such as the cutting of weeds, the clearing of underbrush and general beautification work in parks and streets. This type adds little to the permanent assets of a city unless continued very year.

The other type consists of public construction of a permanently useful nature. Since the funds appropriated are destined for local relief and since such work inevitably involves materials which must be purchased outside the particular locality, some communities have been reluctant at times to use their funds for improvements of this type.

Every city in this country has sections whose real value could be permanently increased by the extension to them of one or all of the necessary community services,

Such work, creating local employment, satisfies the first requirement of American relief, which is based on the principle that the workman wants work rather than charity. Further, it insures that the money, rather than merely adding to the operating expenses, will result in increases in the "capital value" of the community and in the aggregate of the nation. Finally, the materials required, though not purchased locally, provide work elsewhere. The interchange of such materials between the various cities and regions will add its quota to the restoration of normal operation of our complex national economic machine.

Don't Neglect the Ground Connections

Even though power engineers are continually coming to grief because proper protection is lacking on equipment in their plants, they frequently fail to correct hazardous conditions until something happens that involves a serious service interruption and expensive repairs. Yet adequate protection can be had at small cost compared to the risk incurred. Even when proper protection has been provided in the original installation it is often allowed to become inoperative or practically useless by neglect. Probably nowhere is this more true than with ground connections.

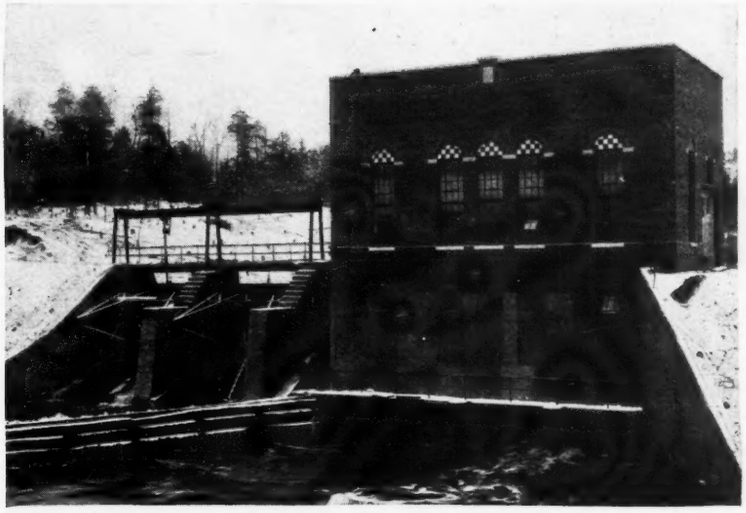
The value of good ground connections is emphasized in the Empire State Gas & Electric Association's committee report on lightning protection. In this report data are given on two hundred and twenty-six transformer failures. Of these, only ten occurred where the transformers were considered properly protected by lightning arresters and low-resistance ground connections. Two of these failures were burnouts and the rest were blown fuses. Most of the remaining two hundred and sixteen failures occurred where the ground connections had fifty ohms' resistance or more.

These data are for transformers on distribution lines, but they nevertheless emphasize the necessity of maintaining low-resistance ground connections wherever necessary to protect life and property. There is no excuse for allowing ground connections to deteriorate. They can be readily tested, and a periodic checking up on their resistance should be part of the inspection and maintenance program. If given proper attention, ground connections, where they are required, will pay large dividends by preventing repair bills, interruptions to power service and hazards to life and property.

▼

POWER Stands for . .

1. Making Power When It Should Be Made
2. Buying Power When It Should Be Bought
3. Cheaper Power Through Modern Equipment
4. Easier Financing of Equipment Purchases
5. Better Use of Byproduct Heat and Power
6. Operating Methods That Save Money
7. Less Waste in Transmission and Application
8. Prevention of Smoke, Within Reason



Crowley plant of the Flambeau Paper Company

Propeller Turbines Gain Favor in Middle West

A number of Kaplan installations show high efficiency over a wide range of load and varying flow. An increase in output ranging from 8 to 25 per cent lowers the cost per kilowatt-hour over the fixed-blade turbine, and the installation of fewer units to use the stream flow usually means lower initial investment

By H. T. PORTER

Manager Chicago District, S. Morgan Smith Company

IT IS a matter of common knowledge that the automatically adjustable-blade turbine some years ago proved itself so successful abroad that today this design has been adopted in the low-head hydro-electric field in Europe almost to the exclusion of any other type of turbine. It was not until three years ago, however, that this type of turbine was placed upon the market in the United States. Accordingly reliable operating results covering output and mechanical performance only recently have become available. The first machine was placed in operation in the summer of 1929. Since that time a considerable number of representative installations under heads of 8 to 40 ft. have been made.

Briefly, the advantages of this type of turbine are utilization of reduced flow at high efficiency and extra available capacity under high-water conditions, owing to the fact that the runner blades can be opened to a wide angle. These advantages apply particularly to streams having low heads and considerable variation of flow, such as predominate in the Middle West. A machine that will efficiently utilize water under reduced-flow conditions, as low as 20 per cent of the designed plant capacity, undoubtedly will permit the economic development of many low-head plants that would not be feasible with the older types of turbine.

Where water storage is available another advantage of this machine is its ability to accommodate itself to temporary demands of the electrical system over a wide range of load without appreciable sacrifice in efficiency.

Among the typical plants in the central section of the country using this type of water turbine mention may be made of the Lake Walk station of the Central Power & Light Company, of San Antonio, Texas. The plant contains one adjustable-blade turbine of 1,900 hp. capacity under 33-ft. head, which drives a 1,500-kva. generator directly at a speed of 277 r.p.m. It is the first machine of Kaplan design to be installed in this country. Both the turbine and the electrical equipment of the plant are fully automatic, so that station attendants are eliminated. To provide condensing water supply for the Devils River steam plant farther down the river, as well as water for cattle and maintenance of boundaries, it is necessary to pass stream flow at all times. Last year this unit operated 97 per cent of the total time without any shutdown for turbine maintenance. In $2\frac{1}{4}$ years of operation the unit has proved itself reliable from a

mechanical standpoint. The operating company has estimated that a gain of output of over 10 per cent per year has resulted from the use of this turbine as compared to other available types of machine.

In December, 1929, the Wisconsin Power & Light Company placed in operation a hydro-electric plant on the Rock River at Rockton, Ill., consisting of one fixed-blade and one adjustable-blade turbine, both of the same physical size. Hydraulically the adjustable-blade turbine develops 980 hp. at 100 r.p.m., and the fixed-blade turbine 730 hp. at the same speed, both under 10½-ft. head. The plant is of the fully automatic type, with no station attendant, being controlled from the load dispatcher's office at Beloit, Wis., some five miles distant. It is not possible to make a direct comparison between the output of this plant and other plants in the vicinity owned by the same company. One significant thing, however, is that the output of this station for the dry year of 1930 equaled the estimate of an average year's output, while all other stations on the river showed a considerable decrease.

Two Types of Turbines Used

A study of river-flow conditions indicated that the selection of one fixed-blade and one automatically adjustable-blade turbine would provide for efficiently using the water. While it is desirable to reduce to a minimum the number of units in a station of this type, it was decided to install two machines because of the difficulties that would have been encountered in the installation of one large unit of double the capacity for the low head of 10½ ft. The fixed-blade turbine is operated only at the point of best efficiency, and the adjustable-blade turbine takes the variations in stream flow. This method of operation applies at all times, except under conditions of high water, when both turbines are operated at their maximum capacities. Under conditions of low water the fixed-blade turbine is shut down and the adjustable-blade turbine operates at the load corresponding to the river flow.

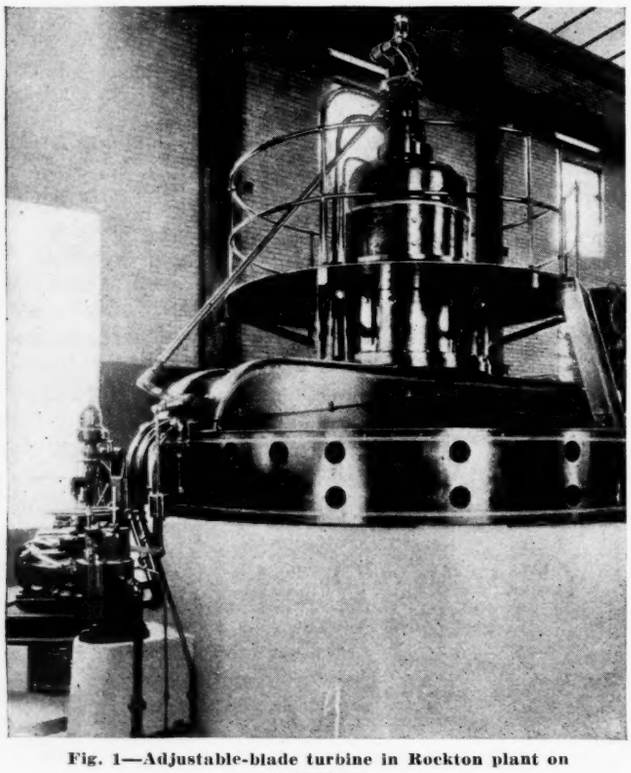


Fig. 1—Adjustable-blade turbine in Rockton plant on Rock River

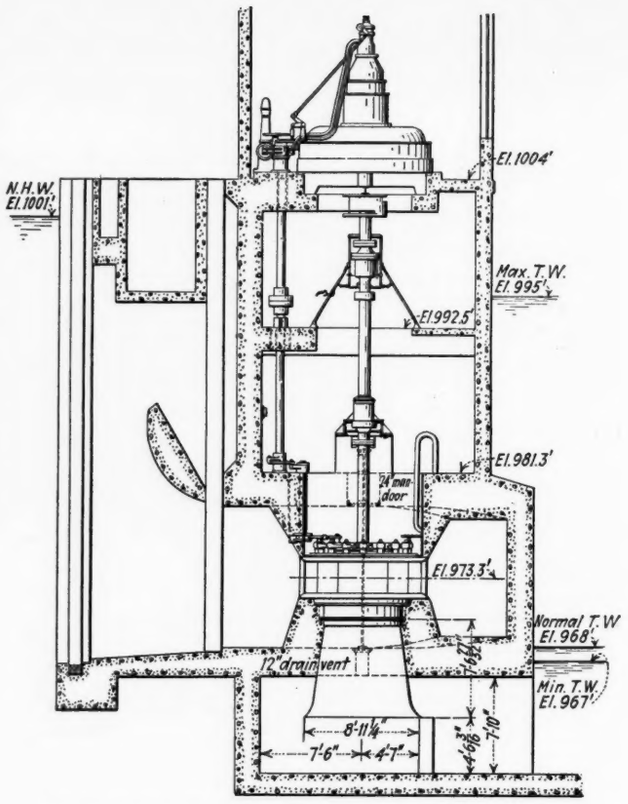


Fig. 2—Section through 1,900-hp. Kaplan turbine-generator installation at Lake Walk plant

In November, 1930, the Flambeau Paper Company, of Park Falls, Wis., placed in operation its new Crowley plant equipped with one adjustable-blade turbine with a capacity of 1,700 hp. at 150 r.p.m. and 19-ft. head, and one fixed-blade turbine with a capacity of 680 hp. at 200 r.p.m. A few miles upstream is the Lower Mill plant, with three fixed-blade high-speed machines, having approximately the same total capacity under 19-ft. head. Both plants are tied into the same system, serving the paper mill. Comparative monthly productions of these two plants have been as follows:

	Crowley Plant Kw.-Hr.	Lower Mill Plant Kw.-Hr.
Dec., 1930	469,000	355,900
Jan., 1931	342,000	268,400
February	237,000	182,700
March	291,000	223,400
April	387,000	286,600
May	336,000	255,200
June	447,000	277,300
Total	2,509,000	1,849,500

The Crowley plant is on a regulated stream with a large seasonal reservoir, located only a short distance upstream from both plants. Before the Crowley plant was constructed engineering estimates of comparative output indicated only about 8 per cent more output for the two units than for the three fixed-blade machines of the Lower Mill plant, as compared to 35 per cent actual increase obtained to date. This advantage is due primarily to the difficulty in maintaining fixed-blade turbines at the point of best efficiency. The adjustable-blade turbine, on the other hand, maintains a high efficiency over a considerable variation of load and head.

An appreciable saving in the cost of the Crowley plant

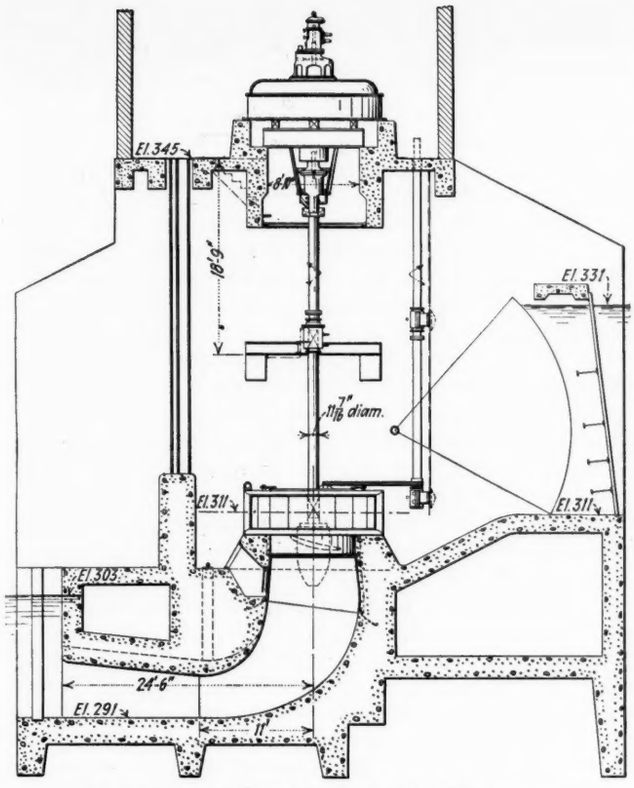


Fig. 3—Typical Kaplan turbine installation on Guadalupe River

could have been made by the installation of one large adjustable-blade turbine instead of two machines, but the user felt at the time that a one-unit plant might involve a rather large element of risk. For the future it is predicted that plants of this type will use but one unit, to take advantage of the reduction in first cost.

At present three plants, each containing one adjustable-blade turbine, are being built on the Guadalupe River, near Seguin, Texas, by the Texas Hydro-Electric Corporation. A careful study covering selection of the type and number of units for each plant indicated that a one-unit automatically adjustable-blade turbine in each case would not only give maximum output, but at the same time would reduce the initial cost of the plants. These three plants will operate under heads varying from 26½ to 29 ft., with capacities from 2,940 to 3,320 hp. each at a speed of 180 revolutions per minute.

Four years ago the same company had erected three plants on the same river, in each of which two units of the Francis type had been installed, so that actual construction costs and hydraulic data were available for guidance in the new work. Engineering estimates had shown not only increased output for a single-unit plant with an automatically adjustable-blade turbine, but a saving of approximately $31,000 for each plant, exclusive of the saving in the cost of hydro and electrical equipment.

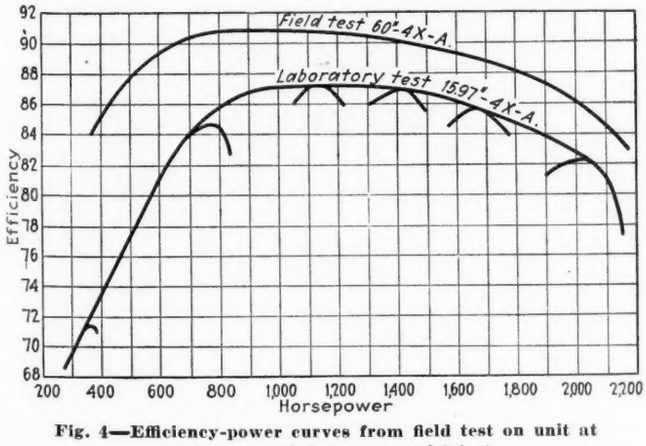


Fig. 4—Efficiency-power curves from field test on unit at Lebanon and laboratory model test

Field Tests Made on Turbines

Two adjustable-blade turbines, each developing approximately 2,100 hp. under 40-ft. head at a speed of 327 r.p.m., were placed in operation in November, 1930, in the Niangua River plant, near Lebanon, Mo., by the Utilities Power & Light Corporation. Shortly after installation these turbines were tested by two methods for efficiency and power. The remarkably flat efficiency curve shown in Fig. 4 was obtained. The efficiencies indicated are the averages from two methods, salt-velocity and current-meter, used by Prof. Floyd A. Nagler, of the University of Iowa. Expectations of accuracy are within 2 per cent. The lower curve, giving the results from the manufacturer's laboratory test of a small homologous model, indicates the accuracy with which operating results can be predicted.

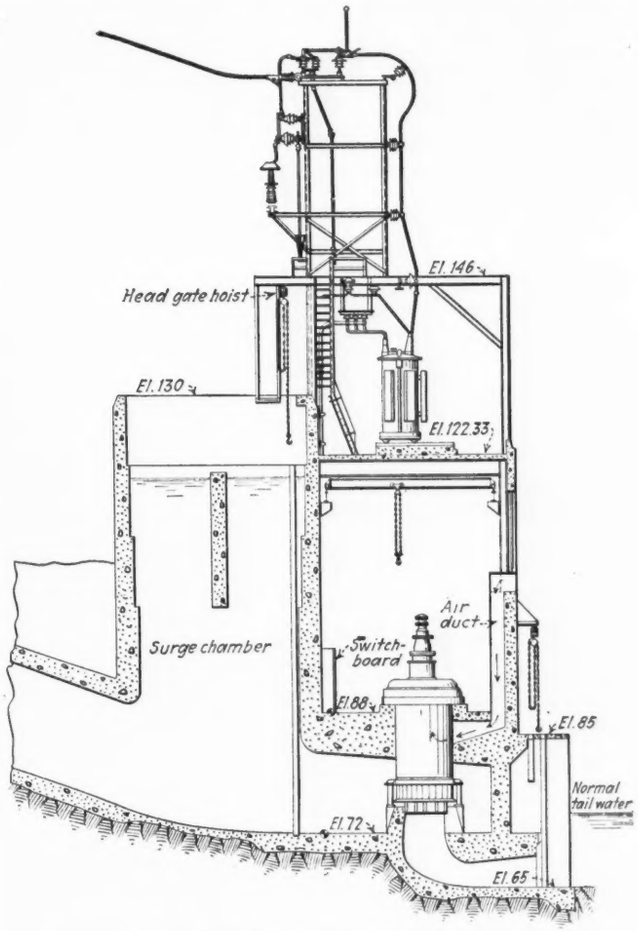


Fig. 5—Section through Lebanon plant and surge chamber

This development has several interesting hydraulic features. The water is supplied to the turbines through a concrete-lined tunnel approximately 900 ft. long. A surge chamber is built integral with the power house. Owing to a head of 40 ft., it was necessary to set the turbine runners, which are of the four-blade type, at approximately tailwater level to avoid cavitation of the runners and vibration. For heads higher than 40 ft.

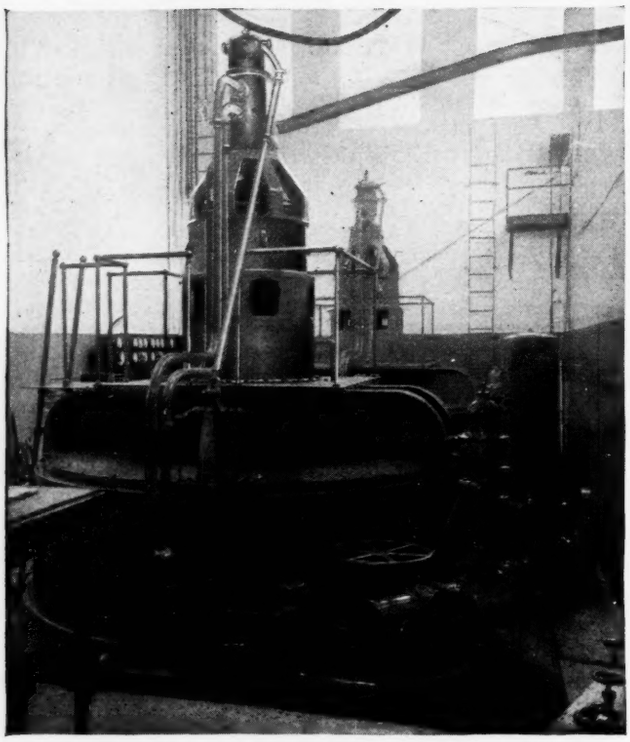


Fig. 6—The two 2,100-hp. Kaplan turbine units in Lebanon station on Niangua River

laboratory cavitation tests indicate the advisability of using five-blade runners.

Fig. 5 shows a section through the plant and surge chamber and Fig. 6 an interior view which gives a good idea of the governing mechanism required for the adjustable-runner blades. From this photograph it can be seen that the valve for controlling the oil supply to the piston in the hollow turbine shaft is mechanically connected to and operated by the governor which controls the wicket gates. Consequently minimum attention is required from the plant operator.

Operating Records

Summarizing, it may be stated that the operating records of automatically adjustable-blade turbines in this country have been excellent in mechanical reliability and hydraulic operating results. Its development and application to American practice not only allows of greater output with correspondingly reduced cost per kilowatt in many plants, but is making possible the development of a large number of low-head plants that would not have been economically feasible with previously existing types of units. While the cost of this type of turbine is considerably more than for the fixed-blade machine of the same physical size, this increase usually represents only 1 to 3 per cent of the total plant investment, as compared with an increase in plant output of from 8 to 25 per cent, depending upon the respective river-flow conditions.

In cases where the adjustable-blade type of turbine allows a reduction in the number of units over fixed-blade requirements to utilize the water efficiently there will be an actual decrease in the cost of plant construction as well as an increase in output.

No particular case can be applied as a rule for every development, but it can be said that the automatically adjustable-blade turbine is an important factor in reducing the cost per kilowatt-hour output in low-load projects.

Reheating Compressed Air

By C. C. HERMANN

A DROP in temperature of compressed air results in loss of volume. But it is imperative that the temperature of the air be lowered in order to reduce the moisture content, as moisture in air causes rapid deterioration of lubricants in the air-consuming machines, such as hoists, air motors, drills, chipping hammers, etc. It also results in rust formation in cylinders, valves and other moving parts, so that considerable investment is made in equipment for its removal. Inter- and after-coolers are generally provided for this purpose.

Since the volume of air varies directly as the absolute temperature, or according to the formula $V_1 = VT_1/T$, in which V is the initial volume, T the initial temperature absolute, V_1 the final volume and T_1 the final temperature absolute, air in the lines having an initial temperature of 190 deg. F., or 649.6 deg. abs., and experiencing a drop of temperature to 114 deg. F., or 573.6 deg. abs., will undergo a loss of volume equal to 11.7 per cent. Conversely, if this air is reheated to its original temperature of 190 deg. F. the volume ratio will be 1 to 1.13. It is assumed, of course, that pressure remains constant.

To take a specific example, suppose the pressure to be 85 lb. gage and that this pressure remains constant. It will be required to heat 7.77 cu.ft. of the air from 114 deg. F. to 190 deg. F. to increase the volume one cubic foot. This cubic foot of air is available for useful work just as truly as though it were compressed in the compressor.

It is important to know just what it will cost to reheat this air to reclaim the lost volume. The specific heat of air at constant pressure is 0.237. The weight of air at 85 lb. gage and at 114 deg. F. is $W = 0.0807 \times 85 \times 492 \div (14.76 \times 574) = 0.399$ lb. per cubic foot. The heat required to raise 7.77 cu.ft. of air from 114 deg. F. to 190 deg. F. is $7.77 \times .399 \times 0.237 \times 76 = 56$ B.t.u.

It is assumed that this air will be heated by exhaust steam at 3 lb. gage, the latent heat of which is 963.7 B.t.u. per pound. It is also assumed that the efficiency of the heater will be 95 per cent. The amount of exhaust steam required per cubic foot of increase in the air volume will be $56 \div (963.7 \times .95) = .061$ lb. This is at the rate of 61 lb. of steam per 1,000 cu.ft. of air increase, or a total heating of 7,770 cu.ft. of air at the original temperature of 114 deg. F.

If the engine supplying the exhaust steam were run condensing its steam rate would be 18 lb. instead of 22.5 lb. per horsepower-hour. Thus the exhaust steam is obtained at the cost of an additional 4.5 lb. of steam. If it costs 38c. per 1,000 lb. to generate steam, the cost of exhaust steam per 1,000 lb. is $4.5 \times 38 \div 22.5 = 7.6$ cents. The cost per 1,000 cu.ft. of air increase would be 0.0046c. Since the cost of compressed air produced by the steam-driven compressor is approximately 3.5c. per 1,000 cu.ft. of free air, the reheating is a paying proposition.

There are a number of reheaters on the market any one of which will do the work. In some plants, however, there have been observed what may be called home-made heaters. These have been generally constructed out of a heat exchanger usually used for heating water. Experience indicates this is not a paying proposition; and where the project is such as would pay at all it is advisable to purchase a regular heat exchanger for air. The tube

bundles are specially adapted for the flow of air at lowest possible friction losses, and in general much higher efficiency will result.

Little gain wil be experienced in reheating compressed air unless the pipe lines are properly covered to retain the heat in the air. A test made not long ago indicated that under normal flow or consumption conditions air reheated to 190 deg. F. with a room temperature of 60 deg. F. lost the heat added before it had reached the first air-consuming tool 280 ft. away from the heater. By covering the pipes the heat may be retained; otherwise the proper solution of the problem would be to install smaller heaters very near the air consuming tools. This latter method would involve the installation of a number of small heaters, which would reduce the over-all efficiency and increase the heat losses from the heaters. The heaters themselves should be covered with at least $\frac{3}{4}$ in. insulation.

Another method is to reheat the air by diluting with air at higher temperature. For instance where the after cooler is used for the elimination of moisture a bypass is installed so that a portion of the air from the compressor may be passed around the cooler and introduced into the distribution lines. This bypass air contains its quota of moisture which must be taken up by the air. It is claimed, however, that the moisture content of the entire volume is such as will not materially interfere with the air tools. The same result may be attained by failure to cool below a given temperature, but the amount of moisture removed by such method is doubtful and it is advisable to adopt one of the former methods of reheating.

Reheating will not eliminate oil from the air. Lubricating oil in the air is especially injurious to air hose and should be removed. Some of the oil will, of course, be removed by the aftercoolers. But the best way to remove the oil is by means of traps. The automatic trap has proved only a partial success in this work. The oil seems to clog the trap and prevents its functioning. It is often necessary to clean these traps daily to insure the removal of the oil. A satisfactory hand trap for oil and whatever moisture still remains in the air may be produced out of a piece of 3-in. pipe provided with a ribbon of steel formed in the shape of a spiral and placed within the pipe with the entrance nozzle at the top on one side of the spiral and the exhaust nozzle at the top and on the opposite side of the spiral. A blow-off cock is placed in the bottom. These separators may be purchased on the market and are usually installed at or near the air-consuming tool or line.

▼ ▼ ▼

Cooling Small Diesel Engines

By LOUIS R. FORD

When planning the installation of a diesel engine it too often happens that the influence of cylinder cooling methods upon engine operation and maintenance is not realized and the cooling system does not receive the study its importance warrants. In many cases the definite assurance that there is water available for circulation through the engine jackets, in the quantity prescribed by the manufacturer, eliminates cooling from any further consideration. As a matter of fact, there are many localities in the United States where the quality of water available for cooling is such that its use constitutes a positive danger to the engine, and adequacy of supply alone does not give assurance of effective cooling

A FUNDAMENTAL requisite for operation of the diesel engine is a means for removing the heat of combustion rapidly enough to prevent the metal of the cylinders from reaching a destructive temperature, or a temperature high enough to prevent good lubrication of the cylinder walls. The major factor in this heat removal is the water flowing over the metal surfaces, but first of all it is important that the metal through which the heat must flow to reach the water be so shaped and dimensioned that the heat-flow paths will be adequate for the amount of heat to be carried away. To provide correct heat-flow paths is a function of the engine designer and something over which the operator has no control, but the keeping of these paths open is often entirely within the operator's control.

Years ago it was established that an elementary requirement in steam boiler operation was that the water surfaces be kept free from scale, and boiler operating procedure invariably includes periodical removal of such scale, or provisions to prevent its formation. The diesel cylinder may be considered a furnace in which a large amount of heat is liberated, a large proportion of which must be transferred through the metal of the cylinder walls to the water in the jackets, and there is no good reason why the same care should not be exercised to prevent scale formation in the jackets as is taken to keep the boiler steaming surfaces clean.

It follows, then, that after ascertaining the nature of the water supply in any locality in which an engine is to be installed the next thing is to determine the quality of the water, judged by the percentage of scale forming solids in solution and the amount of sediment in suspension. The sediment is a less dangerous element than the scale-forming matter, but it does require attention and will be discussed later. The fact that any particular water is suitable for household use does not necessarily mean that it is safe for engine cooling. This is particularly true where the municipal water supply is obtained from wells or from streams which flow through soil containing scale-forming elements. The basis of judgment should be a chemical analysis showing the number of parts of scale-forming solids per million parts of water, or the number of grains of such solids per gallon of water, and no water should be considered fit for engine

cooling if its scale-forming content is so high as to make it unfit for use as boiler feed.

But the definite determination of just what constitutes a good water should not be based solely on a measurement of the total solids, as the nature of these solids must be taken into account. A large amount of soluble salt, such as sodium chloride, is not as harmful as a much smaller amount of the sulphates of calcium and magnesia. The generally recognized evidence of scale-forming constituents in water is called "hardness." Water that contains 1 to 10 gr. of dissolved salts per gallon is known as "soft," while a content of over 25 gr. makes very "hard" water. The scale-forming solids that give the most trouble in engine jackets are the salts of magnesium and calcium, which remain in solution when the water is cold but deposit out in the form

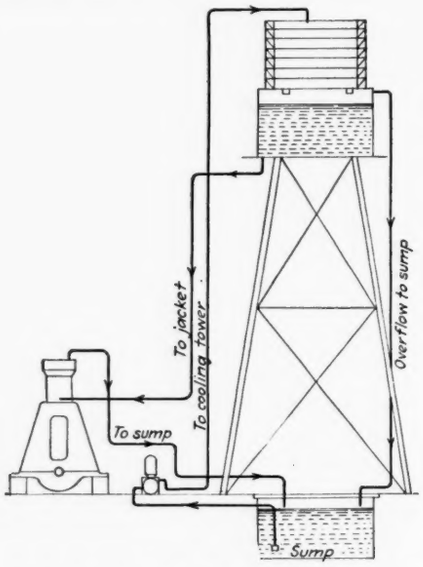


Fig. 1—A popular and moderate-cost cooling system

of scale of varying degrees of hardness as the temperature rises. Organic matter that would cause trouble in boiler-feed water because of its tendency to induce foaming need cause no worry when considering engine cooling. A rough rating accepted by many authorities, which may be used for judging the quality of water to be used for engine cooling is given in the following table:

Gr. of Incrusting Salts per Gal.	Quality
8	Excellent
12–15	Good
15–20	Fair
20–30	Bad
Over 30	Very bad

In places where engines are to be installed a number of different conditions may exist any one of which will influence the arrangement of the cooling-water system. The simplest and most desirable arrangement may be used where a city-water-distribution system is available and the water in the mains is of quality suitable for use in the jackets. If this water is cheap enough all that is necessary to do is to connect from the mains to the inlet of the cooling system and circulate with the main pressure, with the water leaving the jackets wasting to the sewer. The next simplest arrangement is where a well, lake or flowing stream provides water of usable quality. In this case a circulating pump is required to draw the water from the source of supply and discharge it through the jackets. In some cases where this type of cooling system is used the pump keeps an elevated tank filled and water flows by gravity through the engine. The idea on which this is based is that if the pump breaks down the supply of water stored in the tank will prevent immediate stoppage of water circulation and save the engine from damage. That such a precaution is unnecessary is indicated by the fact that all marine diesel engines use direct pump circulation, and the writer has never known of such an engine being damaged by failure of circulating pump.

In many localities the available water is so hard that it is not suitable for use in the engine jackets. In a region having abundant rainfall soft water may be obtained by using gutters on the power house roof and piping the rain water to storage tanks or cisterns. If underground cisterns are used to store the rain water they should be tight against seepage of ground water. A simple way of using the soft water where these conditions exist is shown in Fig. 1. A pump is used to draw water from the storage tank and discharge it to a cooling tower mounted over an elevated tank. The water trickling down through the cooling tower is cooled by contact with the air and falls into the elevated tank, from whence it flows by gravity to the engine jackets and thence back to the storage tank. A variation of this arrangement is to have the pump discharge through the engine jackets to the cooling tower and the water from the tower flow directly into the sump.

Forms of Cooling Towers

The cooling apparatus may take several forms, from the elaborate forced-draft cooling towers and spray ponds of the large power plants to the simply constructed "home-made" cooling tower suitable for the small plant such as here considered. Essentially, such a tower consists of a bank of cooling elements by which the hot water is broken up into a number of small streams. The water flows out of perforated pipes or a pan above these elements and trickles down over them into a tank, or catch basin, at the bottom, being cooled by contact with the air during its passage. The most effective cooling would be obtained if the cooling elements were simply erected on an elevated platform, fully exposed to the air currents, but this would result in considerable water being blown away by the wind. For this reason it is customary to inclose the cooling elements within a square or round tower to shut out the wind. In the case of forced-draft towers, where the cooling air is forced in at the bottom and out at the top by blowers, the sides have no openings; but where natural draft

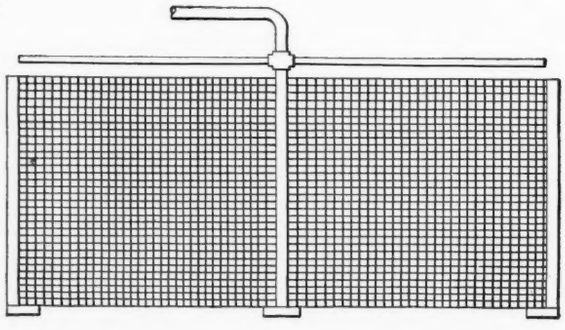


Fig. 2—A wire screen cooling device

is used the sides are usually made of slats slanted upward to form louvers.

About the simplest type of cooling element is the one shown in Fig. 2. It is a vertical wire screen surmounted by a perforated distributing pipe. The water flows out of the perforations in the pipe and trickles down over the screen. One or more of these elements may be used, depending on the size of the engines being served. About one square foot of screen is required for each horsepower of the engine.

An alternative arrangement of the type of cooling system shown in Fig. 1 is to have the main storage tank elevated and the cooling tower with its catch basin at ground level. In this case the water from the elevated storage tank flows through the engine jackets and thence by gravity to the distributing pipe or pan of the cooling element. After falling into the catch basin it is removed by the pump and discharged to the elevated storage tank. Other variations that will best conform to local conditions may suggest themselves, but in general the elevated cooling tower is to be preferred, as it permits better circulation of air around the hot water.

Loss of Water by Evaporation

A feature of this sort of cooling system that must be taken into account is the large loss of soft water by evaporation as it flows over the cooling element. Where rainfall is light, or where soft water must be hauled some distance, it is desirable to eliminate this loss. This can be done by using a closed system for the soft water and cooling it with any hard water that may be available.

An arrangement of this sort is shown in Fig. 3. The pump draws water from the storage tank and passes it through a series of pipe coils before discharging it to the elevated tank. From the elevated tank it flows by gravity to the engine jackets and thence to the storage tank. A second pump takes raw water from any convenient source of supply and discharges it into a perforated distributing pipe above each bank of cooling coils. This water, trickling down over the surfaces of the coils, cools the soft water, then falls into a catch

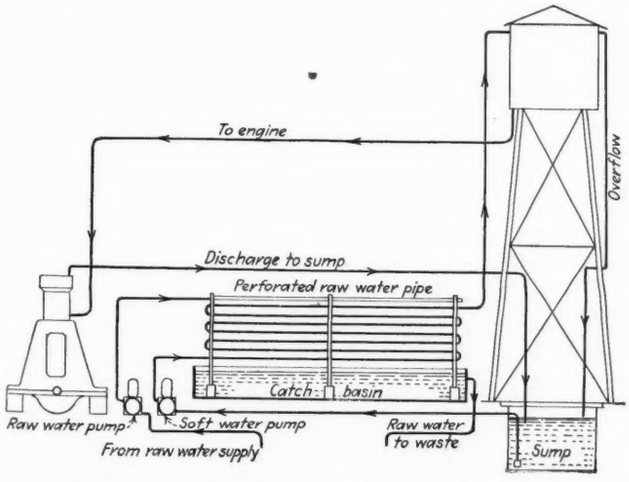


Fig. 3—A closed cooling system with overhead tower

basin under the coils, to drain away to any suitable waste point.

The cooling coils are made up from ordinary iron or steel pipe and return bends and arranged vertically so that the water dripping off of one pipe will fall on the next one underneath it. The total number of coils and their length will depend on local conditions, but in general the length should be that of standard stock pipe, to reduce pipe cutting to a minimum. The size of pipe used should be ample to permit free flow of water, not less than 2 in. diameter, and the total amount used should be such as to give a cooling surface in square feet, not including the return bends, of 1 to 1.3 times the horsepower of the engine served.

In some localities the raw water may be scarce and it will be necessary to use the same water continuously. In this case the raw-water circulating pump is connected to the drain from the raw-water catch basin so that the water can be returned to the distributing pipes. A certain amount of the raw water will be lost by evaporation and additional water must be added to the system from time to time. In warm climates the warm raw water may need to be cooled by passing over a cooling tower.

Cooling by Air

Where the engine power installed is small it is possible to eliminate the use of raw water in the type of system just described. The cooling-water pump draws the water from a storage tank and discharges it through the jackets to the elevated cooling coil, in which it is cooled by air sweeping across the pipe surface. Obviously, more pipe will be required in this system than where raw water is used for cooling. The amount of cooling surface needed will depend on the air temperatures encountered, and will vary from about 5 sq.ft. per engine horsepower where the air is cold to twice that amount in hot climates. It should be noted at this point that this rule, as well as the preceding ones, is purely empirical, based on experience and not on any heat-flow calculations.

No matter what form the cooling arrangement may take, it is of vital importance that scale-forming water should be kept out of the engine jackets. In view of the operating troubles that have been caused by scale in some existing engines it would not be unreasonable for the engine manufacturers to refuse to supply an engine for installation in a locality where the water conditions are known to be bad, unless a satisfactory soft-water system be provided for in the installation plans. Unfortunately, few manufacturers are willing to risk loss of a sale by insistence on this point.

Cleaning Jackets of Mud

I have mentioned that there may be solids in suspension or in solution in the water that do not form scale but which give trouble by depositing out in the jackets as sediment. This condition is apt to be bad where diesel engines are used in connection with irrigation projects, especially in the Southwest, where the water is usually muddy. In localities where the water is free from scale-forming elements its use for cooling need cause no trouble, even though it is very muddy. The sediment that settles out simply collects in the form of soft mud, usually in the lower part of the cylinder jacket, and it can be washed out at intervals. The frequency of cleaning is a matter to be determined by experience, but should be a definitely scheduled part of the operating routine. When the water contains both scale-forming and sediment-forming materials the latter will aggravate the scale conditions, due to the fact that as the scale forms it cements some of the sediment in with it, thus increasing the thickness of the scale. When diesel engines are purchased for use in localities where muddy water will be used for cooling no engine should be chosen that does not provide a means of easy access to the jackets for cleaning.

Trends in the Design of Refrigerating Coils

By R. S. WHEATON

THE constant aim of the refrigerating engineer is to increase the rate of heat flow, or thermal transfer, through metallic walls so that the amount of equipment necessary to perform a stated duty can be decreased. This reduces the initial cost of the equipment. In addition it decreases the number of hours required to remove a stated quantity of heat and also reduces the power costs of operation.

The problem of improving equipment for freezer rooms where products such as sweet cream or ice cream in metal containers are to be frozen has been receiving considerable attention and there is a tendency toward using ammonia coils operating on the flooded principle, with float valve controls for maintaining a predetermined level of liquid ammonia in the equipment. Tests have indicated that where direct expansion coils are used there will be a heat transfer rate of 2½ B.t.u. per hour per square foot of pipe surface per degree difference between the temperatures inside of and outside of the coil. This transfer occurs with an air circulation of around 170 ft. per minute, and gravity, in causing the chilled air in a room to descend toward the floor, sets up a circulation of about this velocity. This heat-transfer rate is also dependent upon the coils being only lightly coated with frost.

Heat-Transfer Rates in Coils

Tests have further shown that under the same conditions as just indicated, but with the coils arranged to operate in the flooded condition, the rate of heat transfer is increased 20 to 25 per cent. Also, as soon as a set of flooded coils is cut into service the entire coil functions at once instead of having the refrigeration creep through

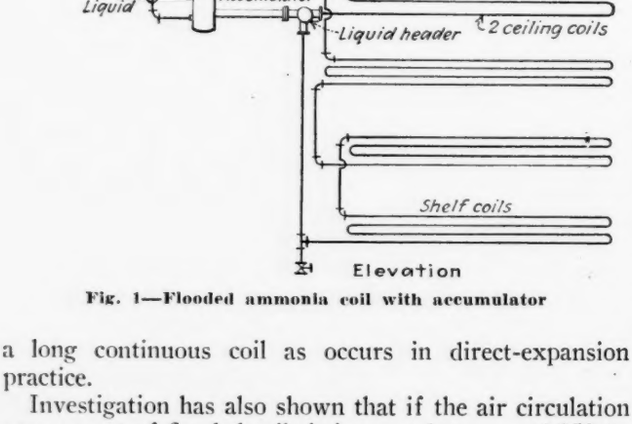


Fig. 1—Flooded ammonia coil with accumulator

a long continuous coil as occurs in direct-expansion practice.

Investigation has also shown that if the air circulation across a set of flooded coils is increased to around 950 ft. per minute the rate of heat transfer is raised to about 10 B.t.u., which, in turn, has led to the introduction of special equipment fitted with electric blowers that drive air over coils placed in a metal box. The air flowing upward across staggered tubes which increase turbulence thus improving heat transfer. The chilled air is then distribu through discharge ducts to all points in the room.

The heating engineer has long known of this. The refrigerating engineer, however, was faced with the difficulty of frost formation on the coils, which under certain conditions, would make this type of unit totally inoperative. This problem has been solved in some cases by using a brine spray to keep the coils clean; in other cases by restricting the use of these cooler units to rooms where the temperature is above freezing all the time. Then, by intermittent operation of the coil but constant operation of the blower; the coil is kept free of

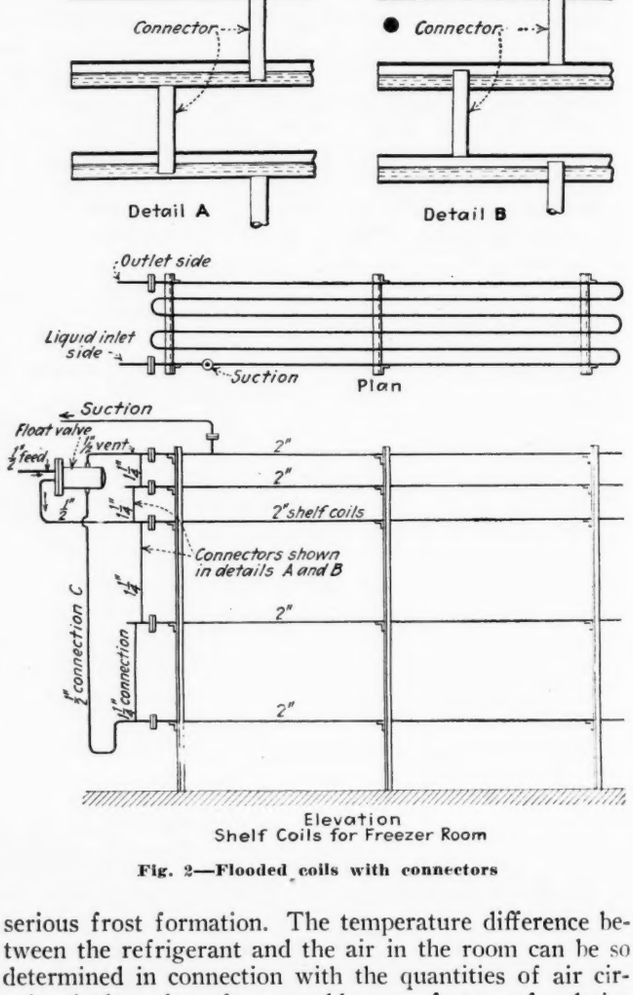


Fig. 2—Flooded coils with connectors

serious frost formation. The temperature difference between the refrigerant and the air in the room can be so determined in connection with the quantities of air circulated that the often troublesome factor of relative humidity can be well controlled.

Forced-draft cooling units operating on the above principle are now available. While this equipment eliminates bunkers and pipe coils and is easily installed, it has its limitations in application, although the principle of forced draft can still be used in a somewhat different manner.

For instance, if a vigorous air circulation is set up in an ordinary freezer room it is surprising to see how the operating time is reduced. It should be remembered, however, that mechanically created air currents are to be used only in freezer rooms where the products to be frozen are in containers, otherwise detrimental freezer burns will be developed. Freezer burns are what is commonly known as frost bite. It is a well-known fact that a person is more liable to be frost bitten when outdoors in zero weather if a cutting wind is blowing than on a still day, even though there is no difference in temperature.

In freezer work, where temperatures of 55 below zero Fahrenheit are used to freeze hams and bacons it is the practice to lay the meat in wooden trays without sides, to restrict air circulation. The usual piping ratio for this work, of one foot of 2-in. pipe to 9/10 of a cubic foot of room space, is quite satisfactory. A curious feature is that the frost formations are of a powdery, feathery texture and can be easily removed every day. This does away with the effort and time involved in defrosting with hot ammonia gas, as heretofore.

Efficiency Differs in Two Coil Types

For smaller size freezer room work where temperatures of around 5 below zero are carried, the sketches show two types of flooded coils which are now being used. The arrangement shown in Fig. 1 makes use of an ammonia accumulator with only a short liquid leg on it. The horizontal accumulator tank must be made large enough in diameter to separate the gas from the liquid when liquid slugs are thrown back through the coil return. Notice that the liquid ammonia is fed through the float valve so as to short circuit the float valve head. Thus the flash gas is driven into the accumulator and is kept out of the float chamber, where it would create enough agitation to interfere with the proper operation of the float.

In Fig. 2 the coil is operated flooded without using an accumulator, which is a recent development. Connection *C* has a dip in it to increase the static head in this riser over the static head in the coil, to prevent the short circuiting of the gas. Detail *A* shows the connectors between the inlet sides of the coil which connect the bottom of one horizontal coil to the bottom of the lower coil. Detail *B* shows the connectors between the outlet sides of the coils which connect the top of one horizontal coil to the top of the next higher coil. In this design the liquid constantly descends through the connectors shown in detail *A* and the gas constantly rises through the connectors shown in detail *B* in a staggered path. The suction connection makes a final change of direction for the suction gas and any entrained drops of liquid are thrown out of the gas stream.

Synchronous Motors Start And Stop Automatically

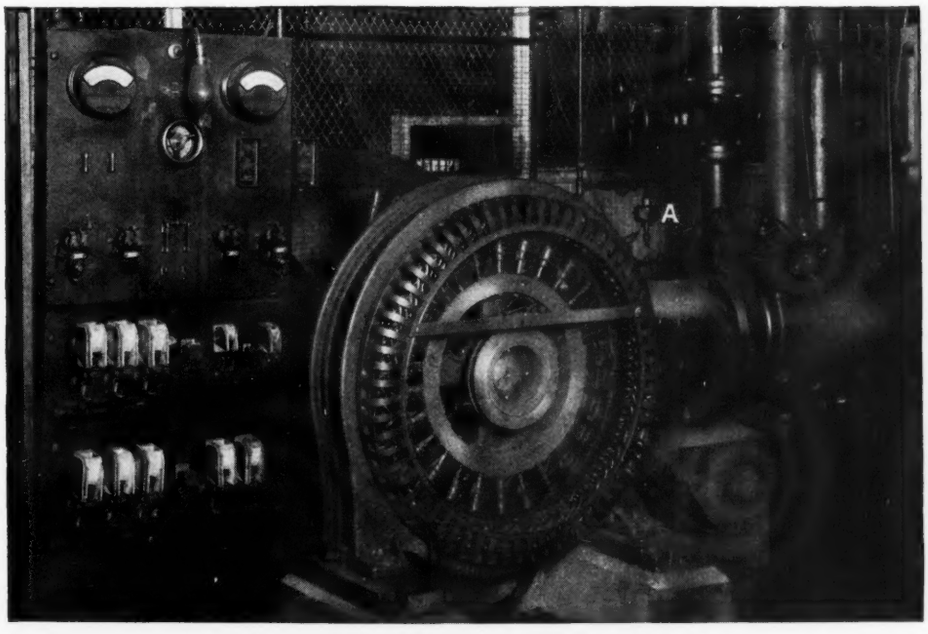
By CARL C. NELSON

SYNCHRONOUS motors driving pumps, air and ammonia compressors, and similar loads can be operated advantageously and economically by starting and stopping them as the water level, air pressure or temperature, as the case may be, reaches upper and lower limits. This operation can be accomplished with full-automatic controllers initiated in their action by float switches, pressure switches, thermostats and similar devices. In addition to the bare controller, auxiliary equipment is required in some cases, depending upon the conditions of application.

Ordinarily, loads of a reciprocating nature, such as air or ammonia compressors, are driven by synchronous motors having low starting and pull-in torques and must be unloaded during the starting and synchronizing period. Thus to obtain automatic start and stop operation it is necessary to provide automatic unloading devices which operate to load the motor when synchronized. Loads such as centrifugal pumps not requiring unloading for starting and synchronizing can be successfully operated to start and stop automatically by providing a motor with sufficient pull-in. torque.

Thus it is possible to so choose control devices and motors with economical torque characteristics to drive the load efficiently, and start and stop automatically to regulate the water level, air pressure or temperature.

The synchronous-motor-driven air compressor shown in the figure is arranged for automatic starting and stopping, the automatic unloader being at *A*. This compressor has been in operation since Sept. 26, 1930, and has averaged over 100 starts and stops per day, or a total of about 40,000, from a switch operated by the receiver-tank pressure. Power is used only when the compressor is working, and the expense of maintenance of the compressor operating unloaded is eliminated.



Synchronous-motor driven air compressor starts and stops automatically

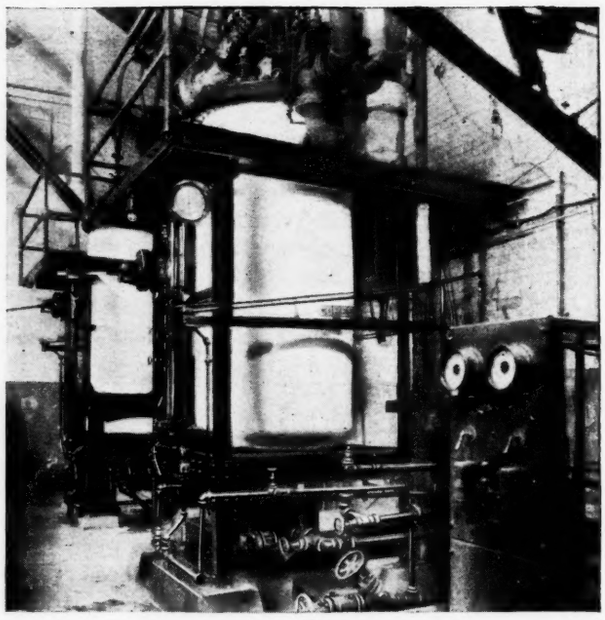


Fig. 1—Two of the three 5,000-kw. electric steam generators that are automatically controlled

Electric Steam Generators Controlled Automatically

By MILTON EATON

Electrical Engineer
Shawinigan Chemicals, Ltd.

A type of automatic control, known as the Eaton, has been developed for Kaelin type of electric steam generators which may be used to maintain constant pressure with varying steam demands, or maintain constant power input when the steam fluctuations are taken by fuel-fired boilers

WITH ordinary methods of hand control electric steam generators respond slowly to changes in steam demand. This results in an objectionable fall in pressure on a sudden increase in steam demand or a rise to blow-off pressure on a sudden decrease in steam flow, unless the steam generators operate in parallel with coal-fired boilers or a steam accumulator. At the plant of the Shawinigan Chemicals, Ltd., Shawinigan Falls, Que., a system for automatically controlling electric steam generators has been developed that is known as the Eaton[1]. It is based on controlling the conductivity of the water carrying the current, thereby regulating the power input or the steam pressure.

When operating at rated capacity an electric steam generator hourly evaporates about ten times as much water as is normally contained in it. Unless the boiler is bled, the concentration of salts in solution, and hence the water's conductivity, and the power input will increase. By varying the amount of bleed-off, the power input can be controlled economically between 25 per cent full-load rating and maximum capacity, with the water level on the electrodes held substantially constant. With 50 per cent condensate feed water the heat losses are about 1 per cent at full load and 4 per cent at half load. Average daily efficiencies on constant-pressure control are about 98 per cent. The efficiency is somewhat higher when operating on constant-power input control. Below half load the losses begin to increase more rapidly. With 75 per cent condensate feed water the efficiency can be held above 90 per cent down to about 25 per cent load. It will probably not be economical to operate an electric steam generator continuously under 25 per cent of full-load capacity.

To maintain constant water level the rate at which feed water is admitted must be increased as the bleed-off is increased and decreased as the bleed-off is decreased. Increasing the rate at which comparatively cool feed water is admitted decreases the temperature of the water carrying the current; its resistance is increased and the power input is decreased. It is obvious that a corresponding temperature effect occurs when the bleed-off is decreased and that this is partly responsible for the change in power input obtained by regulating the amount of bleed-off.

The power taken by an electric steam generator can be rapidly decreased by increasing the bleed, which is more or less saturated with salts in solution, and replacing this with a corresponding amount of comparatively clean and cool feed water. When a sudden, large increase in power input is required, the rate of response to stopping the bleed-off and reducing the feed-water flow to the generator an equal amount is not satisfactory. In this case it is necessary to raise the water level on the electrodes temporarily. After the increased power input is obtained the water level can be returned to normal, where it is held by a decreased rate of bleed-off.

Under certain conditions the increase in power input obtained by raising the water level on the electrodes is not sufficient. This can be adjusted as desired by admitting a regulated amount of salt solution, such as soda ash, at the same time that the water is rising on the electrodes. A simple method of admitting the salt solution is incorporated as part of the automatic control

[1]Patents have been applied for on this system.

system. The cycle of control operation is, briefly, as follows:

The water level is normally constant and the bleed valve is closed. When the power input or steam pressure rises above a certain amount the bleed valve slowly opens, reclosing as soon as sufficient bleed-off occurs to restore normal power input or steam pressure. Should the power input or steam pressure fall below a predetermined value, the water level is raised on the electrodes and at the same time salt solution is admitted. As soon as the power input or steam pressure rises above this given minimum the admission of salt solution is cut off and the water level returns to normal. When constant power-input control is desired a contact-making ammeter is the actuating instrument. For constant pressure control a contact-making pressure gage is used.

Fig. 2 is a diagram of automatic control equipment used with a three-phase electric steam generator of the single-tank type. F is a feed-water regulator, or similar device, connected to the regulator valve R. A feed-water bypass is provided by valve B, which is operated through a reduction gear by motor M. Bleed valve V is operated by motor M_1 through a speed-reduction unit. Limit switch L is operated by a float in chamber C. At A is a contact-making ammeter connected with a current transformer T, and a contact-making pressure gage is shown at G. The contacts on these instruments connect to a double-throw switch S. With this switch either the pressure gage or ammeter may be made the actuating instrument, and constant-pressure or constant-power-input control is obtained as desired. D is a differential tube with which a container E is connected through a needle valve N. Other hand-operated valves are provided as indicated.

The electrical connections for Fig. 2 are given in Fig. 3 and are similarly marked. AG is the contact-making ammeter or pressure gage, depending on which is in service. H and I are magnet switches having one normally closed and two normally open contacts. Definite-time relays K and J have contacts that are normally closed, and R and R_1 are magnetic reversing switches.

With valves V_1, V_2 and V_3, Fig. 2, closed, the electric steam generator is put into service by manipulating feed-water valve V_4 and bleed valve V_5 in the usual manner for hand control. When normal load or normal pressure is obtained the automatic control is brought into service by closing valves V_4 and V_5, opening valves V_1, V_2 and V_3 and closing the control-circuit line switch.

Assume that the control apparatus functions to obtain constant pressure. Contacts a, b and c, Fig. 3, then represent those of the contact-making pressure gage. Fixed contact b is set at slightly over normal pressure and contact c is set at 5 per cent below normal pressure. Contact a moves in response to changes in pressure.

When the pressure rises sufficiently for a to make contact with b, switch H closes. The closing of this contactor energizes one of the direction contactors of reversing switch R, causing it to close and motor M_1 to rotate in such a direction that bleed valve V is slowly opened. Limit switch L_2 is adjusted so that the bleed valve does not open more than is necessary to cause sufficient bleed-off for the power input and steam pressure to decrease at a satisfactory rate. As soon as the pressure falls sufficiently to cause moving contact a to break from contact b, switch H is deenergized and its top contacts open and its bottom contact closes. Closing the bottom contact on H energizes the solenoid of the other direction contactor in reversing switch R, causing motor M_1 to close bleed valve V. When the valve is closed limit switch L_2 opens to deenergize switch R and stop the motor. Bleed valve V should not open or close fast enough to appreciably disturb the water level. If it moves slowly the feed-water regulator has sufficient time to adjust itself to meet the required changes in feed-water demand.

If a sudden increase in steam demand causes the pressure to fall sufficiently to bring the moving contact of the instrument against c, contactor I is energized. The normally closed contact on I opens and the top contacts close. Closing these contacts completes the circuit for the solenoid of one of the direction contactors on reversing switch R_1, which closes. The direction switches closing causes motor M to rotate and open bypass valve B, Fig. 2. Opening this valve allows feed water to pass through differential tube D and valve V_6, thus bypassing regulator valve R and allowing the water level to rise on the electrodes. Valve V_6 is adjusted so that the water level rises very slowly.

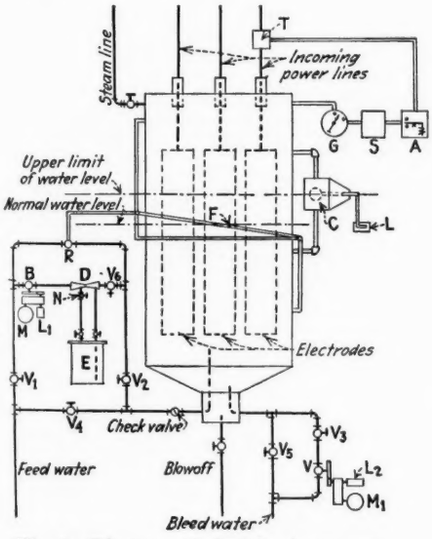


Fig. 2—Diagram of electric steam generator water and steam connections

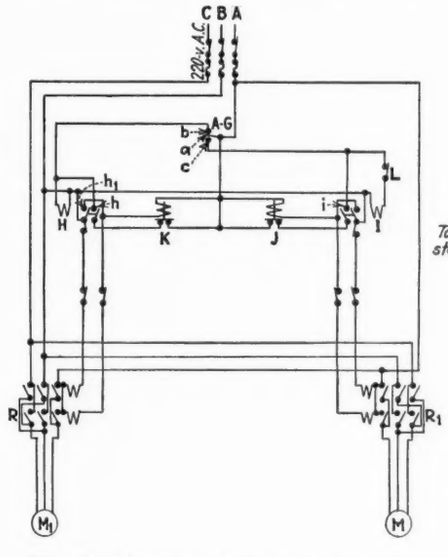


Fig. 3—Diagram of the electric connections for automatic control

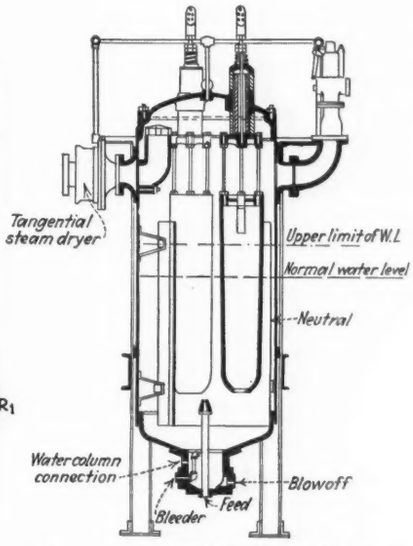
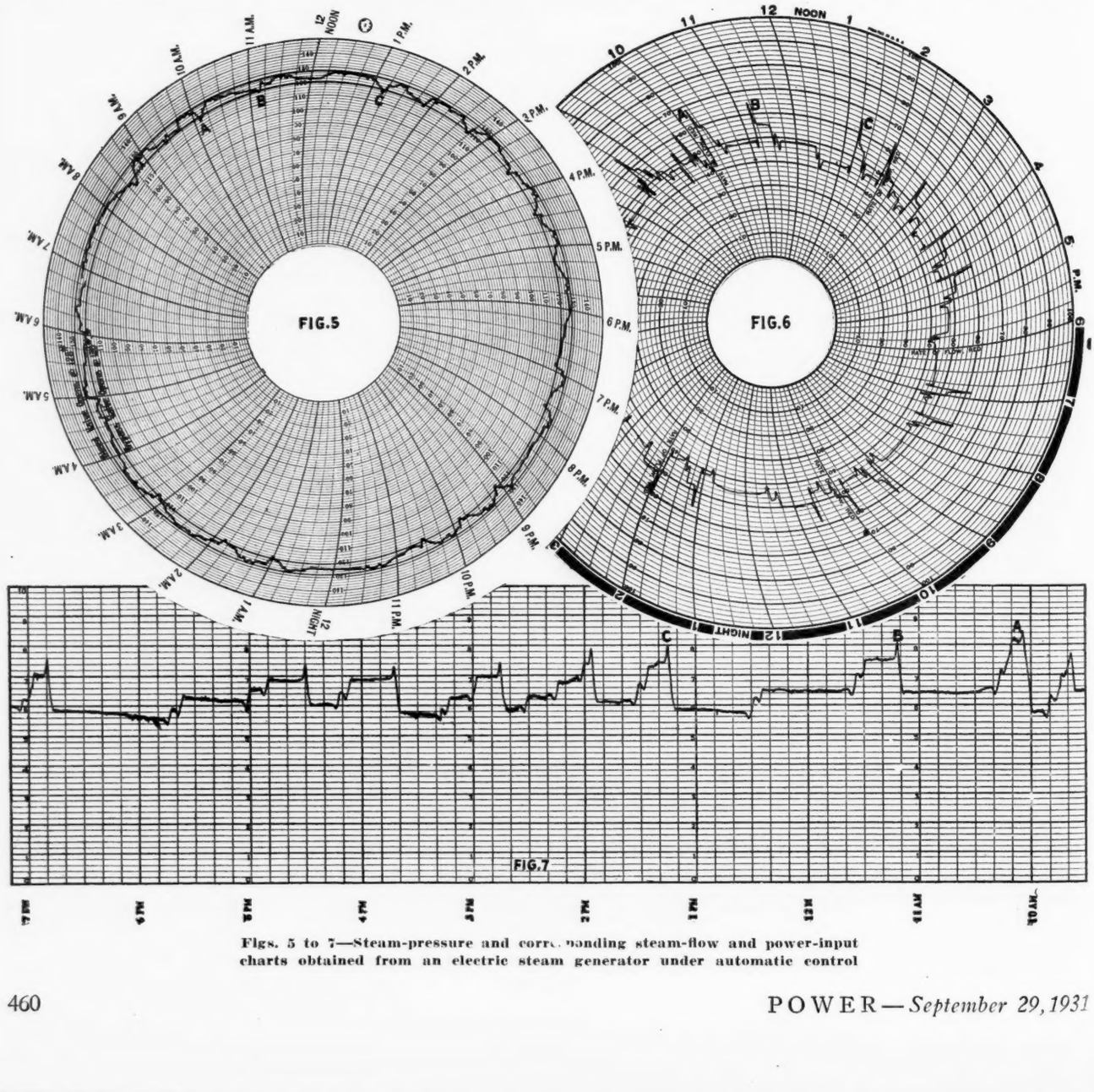


Fig. 4—Cross-section through three-phase electric steam generator

Water passing through differential tube D takes up a soda-ash solution from container E. Needle valve N is adjusted to limit the rate at which this salt solution is admitted. As the water level rises on the electrodes and salt solution is fed into the feed water the power input and steam pressure rise. When the contact on the pressure gage opens, contactor I and reversing switch R_1 also open. The bottom contact of contactor I closing energizes the other direction contactor of reversing switch R_1. When this switch closes motor M is caused to close bypass valve B. Limit switch L_1 controls reversing switch R_1 and stops the motor when the valve reaches its open or closed position. If contact a on the instrument is still closed with c when the water level reaches its upper limit, float C opens limit switch L, Figs. 2 and 3, which, in turn, opens the circuit through the solenoid of contactor I and causes bypass valve B to close as previously described. Limit switch L and motor-operated valve B then become substantially a feed-water regulator holding the water level at its upper limit until the pressure rises sufficiently to open the contacts in the instrument. When the latter occurs bypass valve B closes and no more water is admitted until the level returns to normal, where it is again held by the feed-water regulator. Bypass valve B should not open or close fast enough to disturb the feed-water pressure when it is regulated by an excess-pressure governor.

There is an appreciable lag between the feeding of salt solution and rise in steam pressure. The lag tends to cause the power input and steam pressure to rise higher than desired after the bypass valve closes. This condition is corrected by the water receding from its upper level limit to normal.

On account of changes in pressure being slow and somewhat pulsating, objectionable arcing would occur between the contacts of regulating instrument, unless means were provided to avoid it. Such arcing is accompanied by chattering of the control switches and probably freezing of contacts. When moving contact a of the instrument touches b, contactor H closes. Contact h on closing completes a holding circuit, through the normally closed contacts K of the time relay, for coil H. This circuit bridges contacts a and b of the instrument, thus eliminating any tendency they may have to arc. Closing contact h_1 of switch H energizes the coil of time relay K. After the time setting of relay K has elapsed, its contacts open allowing switch H to open if contact is broken between a and b. The time setting of relay K should be such that under steady load conditions its contacts open just after contact is broken between a and b. The time relay must be of a type that resets instantaneously when deenergized, in order that when contactor H



Figs. 5 to 7—Steam-pressure and corresponding steam-flow and power-input charts obtained from an electric steam generator under automatic control

opens it immediately resets and functions again if arcing occurs between *a* and *b*. Arcing between contacts *a* and *c* is similarly avoided by means of time relay *J* and contact *i* of switch *I*.

The operation for constant power-input control is the same as described for constant pressure, except that in the former a contact-making ammeter is used as the actuating instrument. Normal power input is determined by the ratio of the current transformer connected with the instrument and the adjustment of a rheostat forming a bypass circuit. This method is used by the General Electric Company in connection with electric furnace control.

To apply this system of control to a three-phase electric steam generator having a separate tank for each electrode, or to any number of units operating in parallel, a separate control is required for each unit. If constant pressure control is desired, one contact-making pressure gage is used, together with current-balance relays which supervise the operation of the bleed valves in such a way that the correct ratio of power taken by each phase is maintained.

The advantages of automatic control on electric steam generators are :

1. Steam pressure and power input are held between closer limits than is possible on hand control.
2. Quick response to changes in steam demand make it possible to maintain fairly steady pressure with fluctuating loads, thus obviating the necessity of a steam accumulator for stabilizing the pressure.
3. Improved efficiency on account of closer regulation of feed water and steam pressure.
4. If the electric steam generator is located near coal-fired boilers where an attendant is available in the event of trouble no additional attendant is required.

Shawiningan Chemicals, Ltd., has in operation three 5,000-kw. electric steam generators of the single-tank type which are operated at 2,200 and 3,600 volts, 3-phase. These steam generators, two of which are shown in Fig. 1, are controlled automatically and may be operated to obtain either constant pressure or constant power input. When sufficient power is available to supply all the steam for the plant they are operated on constant-pressure control. When insufficient electric power is available to meet steam demands, they are put on constant-power-input control, the pressure regulation being taken care of by coal-fired boilers. On constant-power-input control the bypass valve opens only when the load-adjusting rheostat is moved to obtain a greater power input. As soon as the corresponding increase in power is effected the bypass valve closes and remains closed to the setting for bleed-valve operation. The bleed valve then opens for short periods at intervals of 15 or 20 minutes.

A comparison of the steam-pressure, steam-flow, and kilowatt-input graphic charts, Figs. 5, 6 and 7, shows that the power input closely follows the steam demand and that the steam pressure is held within close limits. Similar letters on the three curves indicate corresponding periods. For example, shortly after 10 a.m., Fig. 5, at *A*, the steam pressure drops. On the steam-flow graph, Fig. 6, the constant is 390, therefore from 10 to 10:10 a.m. the steam demand increased from 15,600 to 26,520 lb. flow. During this period the power input increased from 5,750 to 8,500 kw., as indicated at *A*, Fig. 7. A comparison of the steam-flow and power charts shows that power input closely follows the steam demand.

Except for short periods, during the 24 hr. of operation the steam pressure, Fig. 5, remained between the limits of 120 and 128 lb. When the pressure reached 128 lb. the bleed valve opened and reduced the concentration in the boiler water. At 120 lb. pressure the bypass valve opened to raise the water level above normal and at the same time added soda ash to the water to increase its conductivity.

▼

Decreasing Warming-Up Time On Large Fire-Tube Boilers

"UNEQUAL EXPANSION" is a term familiar to most operators, but its occurrence is not always recognized.

In industrial plants which shut down over the week-end or have spare boilers of the fire-tube type it is often necessary to put these boilers on the line on short notice. Severe expansion stresses are sometimes set up in joints of locomotive type, large horizontal return-tubular, and Scotch marine boilers when bringing them up to a steaming temperature in a short time.

In some fire-tube boilers a special small circulating pump is employed to avoid this unequal expansion and thereby greatly shorten the time needed to warm up such boilers. This circulating pump may be a small motor-driven centrifugal or, if steam is available from other boilers, a small steam-driven feed pump. An extra heavy line should be tied into the blowdown line with a tee and connected through the circulating pump to the feed line inlet to the boiler.

As soon as the boiler is fired up the blowdown is opened for its usual period to blow down scale on other deposits. After again filling the boiler to the proper steaming level the feed-water supply valve to the boiler is shut and the circulating-pump connection to the blowdown line is opened. By running this pump slowly a positive circulation is assured, thus practically eliminating the tendency for cold water to settle in the water legs, in the rear of the drum or in the other usual dead parts of the boiler. The starting time will be cut about half by this arrangement.

▼

England Changing to Alternating Current

THE UTILITIES of Great Britain are encountering some unexpected difficulties in changing over England's electric supply from direct to alternating current. They knew by their sales that many domestic energy-consuming devices were being connected, but the number and range of these (especially radios) came as a revelation. In authorizing the changeover the Electricity Commissioners stipulated that consumers' apparatus be altered or exchanged to make it suitable to the new supply. In many cases the voltage as well as the current has to be changed, 400-230 volts now being standard.

In changing over works, the perpetual question of variable-speed alternating-current motors crops up. Pressure is sometimes brought to bear on the consumer to use slip-ring resistance control or cone pulleys when the situation really calls for an alternating-current commutator motor with speed variation by brush position, of which some excellent examples are now available.

A Digest of Smoke Ordinances

THE ACCOMPANYING compilation of smoke ordinances is based upon a survey initiated by H. K. Kugel, smoke commissioner of Cleveland, Ohio, as an activity of the Fuels Division of the American Society of Mechanical Engineers, the tabulation and amplification of the data having been carried out through the cooperative effort of the A.S.M.E. and the editorial staff of *Power*. It is the first collection of such information to be published and will serve as a useful guide to smoke-abatement work now being carried out throughout this country and Canada.

About one hundred and twenty-five cities are covered. Other have not responded. A study of the various ordinances shows a wide discrepancy in the individual requirements. A few are what might be termed model ordinances, whereas others are too general to be effective. Some are operating under provisions incorporated thirty years or more ago and are inadequate to meet present-day practice. It will be noted that over half of the regulations contain provisions covering smoke from railroads and a number also apply to marine installations.

Enforcement in some cases is intrusted to building departments, in others to fire marshals, the police, health departments or sanitation bureaus, while twenty-one

City	Population 1930	Dept. Head	Advisory Board	Comparison Method	Smoke Allowed	
Akron, Ohio.	253,653	R. C. Demary, Chief Inspector.	5 Members; authority to employ consulting engineer.	Umbrascope.	2 m. in 15; 6 m. every 24 hrs. for new fire.	Yes.
Albany, N. Y.	127,358	James W. Willse, Health Officer	None.	Ringelmann Chart No. 3.	1½ m. max.; 10 m. in 1 hr. for cleaning or building new fire.	
Atlanta, Ga.	266,559	A. W. Jones, Inspector.	Sanitary Department.	Ringelmann Chart No. 3.	12 m. in any hour in cleaning or building new fire.	Yes.
Atlantic City, N. J.	65,748	None.		Smoke containing soot in sufficient quantity to cause deposit.		
Auburn, N. Y.	36,481	M. S. Irish, Building Superintendent.	None.	Dense or thick black smoke.	6 m. in 1 hr. when cleaning fire or building new.	Yes
Baltimore, Md.	801,741	Commissioner for Smoke Control.	5 members appointed by Mayor to serve without compensation.	Ringelmann Chart No. 3.	Sufficient for cleaning or building new fire, consumption of waste or emergencies.	Yes.
Battle Creek, Mich.	43,301	Fire Chief.	None.	Umbrascope.	6 m. in 1 hr. while cleaning fire or building new.	
Bay City, Mich.	49,600			If deleterious to health or public convenience.	30 m. while cleaning fire or building new—once in 6 consecutive hours.	
Massachusetts Includes: Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Canton, Chelsea, Dedham, Everett, Lynn, Malden, Medford, Melrose, Milton, Needham, Newton, Quincy, Revere, Saugus, Somerville, Stoneham, Wakefield, Waltham, Watertown, Weymouth, Winchester, Winthrop and Woburn.		David A. Chapman, Director of Division Smoke Inspection.	Division of Smoke Inspection—with Director and Advisory Council of 5 members.	Ringelmann Chart—(See classifications in "Allowance" column).	Emission of smoke of a deg. of darkness or density equal to No. 2 of the chart or greater, for more than 6 min. in any one hour from stacks of Class I; or of a deg. equal to No. 3 of the chart or greater, for more than 3 min. in any one hour from stacks of Class II; or of a deg. equal to No. 2 of the chart or greater, for more than 25 min. in any one hour but not exceeding during said 25 min. a deg. equal to No. 3 of the chart or greater for more than 5 min. from stacks of Class III; or of a deg. equal to No. 3 of the chart or greater for more than 3 min. in any one hour from stacks of Class IV, for more than 5 min. in any one hour from stacks of Class V, and for more than 20 sec. in any one period of 5 min. from stacks of Class VI, is hereby prohibited.	Yes.
Buffalo, N. Y.	573,000	Frank E. Trumble, Asst. Chief Inspector, Dept. of Health.	None.	Ringelmann Chart—No. 3.	6 m. in 1 hr. from stationary plants while cleaning fire or building new—1 m. in 1 hr. from locomotives and steamboats, and 8 m. in 1 hr. when cleaning fire or building new.	Yes.
Canton, Ohio.	105,524	John Lenhert, Inspector.	5 men; can employ consulting engineer.	Ringelmann Chart—No. 3.	6 m. dense smoke at one time or not exceeding 12 m. in 1 hr.	
Cedar, Rapids.	56,078	Building Inspector.	None.	Ringelmann Chart—No. 3.	Equal to No. 2; greater permitted to 6 consecutive minutes but not less than 50 m. from time when density of No. 2 is emitted.	

in American Cities and Canada

have ordinances with no set-up for enforcement. Those that have separate smoke-inspection departments and advisory boards, including one or more engineers, will readily be identified with the most progressive smoke-abatement work now being carried on. Experience shows that engineers and firemen will listen to and cooperate with inspectors and boards that have engineering qualifications, whereas they are, as a rule, antagonistic to political or other non-technical appointees.

Over half the ordinances specify the Ringelmann chart, and a considerable number of the Umbrascope, as the method of comparison; but far too many simply prohibit the making of dense smoke without defining it.

The most striking feature of the compilation is the inadequacy of annual appropriations for enforcement, especially when referred to a per capita basis.

It is hoped that those cities which have no smoke ordinances or have inadequate ordinances will profit by what the more progressive cities are doing in this line. In anticipation that there may be a number of requests for additional copies of the tabulation from those concerned with smoke abatement, the type will be held. If the number of such requests warrants reprinting the tables, copies will be available.

Applies to Railroads	Applies to Marine	Installation Permit Registered	Penalty	Annual Budget	Remarks
Yes.		Yes.	Not less than $10 or more than $100 for each offense.	$3,000	Timed photographs may be used to supplement visual methods. Ordinance covers the emission of soot, cinders or noxious fumes.
		Yes.	1st. conviction $50; subsequent $100 to $500.		State law—including Albany and within 2 miles of city.
Yes.		Yes.			
			Not less than $25 or over $200; can be jailed 10 days in default.		
Yes	Yes	Yes	Public nuisance.		Ordinance does not apply to private residences. It is inoperative between the hours of 4 to 6 am.
Yes.	Yes.	Yes.	Not less than $5 nor more than $100 for each offense. Each day counted a separate offence.		New ordinance went into effect on Aug. 13. Commissioner must be an engineer.
		No.	$5 to $25—not less than $100 2nd offense; $100 to $300 if continued.		
			$10 to $100 for each day—may be jailed 90 days in default.		
Yes.	Yes.	Yes.	1st. offense, $10-$50; $20-$100 succeeding offences.		Salaries divided among cities in District. Ordinance classifies stacks as follows: *Class I*—All stationary stacks having an inside diameter at the top not greater than the area of 5-ft. circle. *Class II*.—All stationary stacks having an inside area at the top not greater than the area of 5-ft. circle, but not exceeding 10-ft. circle area. *Class III*.—All stationary stacks having inside top area greater than 10-ft. circle area. *Class IV*.—All stacks of vessels having inside top area not exceeding area of 4-ft. circle. *Class V*.—All stacks of vessels having inside top area greater than area of 4-ft. circle. *Class IV*.—All stacks on steam locomotives.
Yes.		Yes.	Not over $250 for each offense.	$20,215 (6 men).	Preventions and abatement of smoke, soot, dust, sand, chaff, noxious gas and industrial noises, covered in ordinance.
		Yes.	$10 to $100 for each offense.		
		No.	Not over $100 or imprisonment not exceeding 30 days.	$12,340 (4 men).	

Smoke Abatement Regulations

City	Population 1930	Dept. Head	Advisory Board	Comparison Method	Smoke Allowed
Charleston, S. C.	62,123			None.	
Chattanooga, Tenn.	119,539	Stewart Roberts, Director Smoke Abatement.	None.	Ringelmann Chart—No. 3.	Dense smoke more than 1 m. except for periods not to exceed 6 m. in any 1 hr. when cleaning fires or building new.
Chicago, Ill.	3,375,235	Frank A. Chambers, Chief Smoke Inspector.	Commission 5 city officials and advisory board of 9 engineers.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fire or building new one; prohibited when it is a nuisance.
Cicero, Ill.	65,776	Dr. H. J. Hood, Com'r Health.	None.	Dense smoke.	6 m. in 1 hr. when cleaning fire or building new.
Cincinnati, Ohio.	449,331	Gordon Rowe, Ch. Sm. Ins.	None.	Umbrascope No. 1.	Periods aggregating 6 m. in 1 hr. when cleaning fire or building new.
Cleveland, Ohio.	901,376	H. K. Kugel, Smoke Com'r.	None.	Ringelmann Chart.	6 m. in 1 hr., when cleaning fire or building new.
Colorado Springs, Colo.	32,450	Police Dept.	None.	Dense smoke.	Prohibited when a nuisance.
Columbus, Ohio.	289,056	H.S. Needham, Smoke Inspector.	Commission of 3 men (1 combustion engineer and 2 others.)	Umbrascope.	6 m. in 1 hr. when cleaning fire or building new.
Council Bluffs, Iowa.	42,023	Arthur E. Rapp, Building, Inspector.	None.	None—dense smoke.	
Danville, Ill.	36,646	None.		None—dense smoke.	2½ m. while cleaning firebox or fuel added.
Dayton, Ohio.	200,225	Howard Yost, Supervisor, Smoke Regulation.	None.	Ringelmann Chart—No. 3.	3 m. in any 15-m. period—20 m. a day for new fire.
Davenport, Iowa.	60,728	Howard S. Muesse (Bldg. Com'r), Smoke Inspector.	Commission of 5 men.	Ringelmann Chart.	Dense smoke over 6 m. in 1 hr. prohibited—defined as No.3
Decatur, Ill.	57,510			None—dense smoke.	6 m. in 1 hr. when cleaning fire or building new.
Denver, Colo.	287,644	Harry E. Wright, Smoke Inspector.	Commission of 5 members (3 engineers; 1 real estate owner; 1 manufacturer).	Ringelmann Chart—No. 12	For 15 m. while cleaning fire or building new.
Des Moines, Iowa.	142,469	Chas. S. Barker, Smoke Inspector.		Ringelmann Chart—No. 3.	6 m. in any 1 hr.
Detroit, Mich.	1,564,397	Chas. J. McCabe, Chief Smoke Inspector.	Mayor may appoint board of 3.	Umbrascope.	20 m. in any 1 hr.—once every 24 hrs. when building new fire—6 m. in 1 hr. and not exceeding 2 m. of continuous emission of dense smoke.
Duluth, Minn.	101,231	M. P. Orchard (Health Dept.), Smoke Inspector.	None.	Ringelmann Chart—No. 3.	3 m. in any 6 consecutive minutes, not to exceed 6 m. in 1 hr. or 22 m. in 8 consecutive hours when building fires.
East Chicago, Ind.	54,660				
East Cleveland, Ohio.	40,279	John Cowing, Smoke Inspector.	Smoke Abatement Com. of 3 can employ consulting engineer. engineer.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.
East Orange, N. J.	67,344	F. J. Osborne, Health Officer.	None.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.
Easton, Pa.	34,328	Under Department of Safety.	Council may appoint com. of 5.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.
Erie, Pa.	115,875	Timothy J. Ring, Smoke Inspector.	3 engineers.	Ringelmann Chart—No. 3.	2 m. in 15—20 m. in 24 hrs. while cleaning or building fires.
Evanston, Il.	61,766	E. M. Goodman, (Bldg. Com'r) Inspector.	None.	Ringelmann Chart—No. 3. 6	m. in 1 hr. when cleaning fires or building new.
Flint, Mich.	156,422	E. W. Hills, Smoke Inspector.	Safety Inspector Department.	None.	6 m. in 1 hr. when cleaning fires or building new. Defined; cannot be seen at point of emission.
Fort Wayne, Ind.	115,121	Mr. DeWeese, Bldg. Dept.		None.	6 m. in 1 hr. when cleaning fires or building new.
Grand Rapids, Mich.	168,234	Glen M. Jewel., Inspector.	Smoke Appeal Board—City Mgr., Director of Public Service, Pres. City Commission—authority to employ con. engr.	Ringelmann Chart—No. 3.	5 m. in any 1 hr.

in Principal American Cities

Applies to Railroads	Applies to Marine	Installation Permit Registered	Penalty	Annual Budget	Remarks
Applies only to railroad roundhouses.					
Yes.	Yes.	Yes.	$2 to $50.		Ordinance contains specifications for power and heating plant installations.
Yes.	Yes.	Yes.	$25 to $100 for each offense.	(1930) $68,320	Rules and regulations shall be established by Commission. Stokers have been required on all boilers since Jan. 1, 1930. Emission of dust, soot, and noxious gases prohibited.
		No.	$1 to $100.		
Yes.	Yes.	Yes.	1st offense, $25 to $100—2nd, $50 to $200—subsequent, $100 to $300 and imprisonment, 10 days or more than 30.	(1928) $15,840	Definite rules given, hot-air furnaces included. Stokers required over 160 hp.
		Yes.	$10 to $100.		
		None.	$5 to $50.		The emissions of dense smoke or any obnoxious gas or vapor prohibited.
Yes.		Yes—graduated scale.	1st offense, $10 to $50—2nd, $25 to $100—3d, $50 to $200.	(1930) $3,640	
					No ordinance. Operates under statute declaring dense smoke a nuisance.
			$10 to $100 for each offense.		City clerk states ordinance has never been enforced.
		Yes.			H.R.T. boilers having 840 sq.ft. or more must have stokers; watertube, 700 sq.ft. or more, require stokers. Boilers of 15 lb. pressure or less, with rated capacity of 1,600 sq.ft. shall be downdraft or equivalent construction.
		Yes.	$10 to $100.		
Yes.		No.	$5 to $50.		
		Yes.	$10 to $100.		Commission to establish rules.
		Yes.	$10 to $100.		Definite rules are given.
Railroad amendment allows emission of smoke for not longer than 5 m. at one time nor more than 12 m. in 1 hr.	While tied to dock.	No.	$100 or imprisonment for 90 days or both.	$29,580	Dept. of Buildings and Safety Eng'g. has code in formative stage.
		Yes.	Not more than $100 or imprisonment for 30 days.		Ordinance being revised to include advisory board with consulting engineers services in place of smoke inspector.
Ordinance controls locomotives in residential parts of E. Chicago					No further information.
Yes.		Yes.	$25 to $400.	None.	Commission has authority to prepare rules and regulations. Ordinance prohibits the emission of poisonous, obnoxious gas, fumes, soot, sparks, dust or dense smoke.
Locomotives must not be fired while not in motion nor until 10 steam exhausts after starting.			$5 to $100.		
Yes.		Yes.	$5 to $50.	$3,000	Ordinance prohibits the emission of soot, cinders dust, gas or steam.
Yes.		Yes.	1st. conviction $25—2nd., $50—3rd., $100.	$4,500	Cinders, dust, gases, etc. declared a nuisance.
Yes.	Yes.	Yes.	$10 to $100.	$3,000	Amendment provides that all new boilers rated at 100 hp. or over, and all new heating plants serving 1,200 sq.ft. direct radiation, must be equipped with mechanical fuel-feeding device approved by Building Commissioner.
Yes.		Yes.	Not exceeding $100—imprisonment not over 90 days—or both	$200	
		No.	$5 to $100.		
Yes.	No.	Yes.	$10 to $100 and imprisonment not exceeding 90 days.	$2,800	Covers dust, ashes and cinders.

Smoke Abatement Regulations

City	Population 1930	Dept. Head	Advisory Board	Comparison Method	Smoke Allowed
Green Bay, Wis.	37,329	Albert Manders, Building, Inspector.	None at present. Committee of 5 contemplated.	Ringelmann Chart.	3 m. in 2 hr. when cleaning fires or building new.
Greensboro, N. C.	53,422	Building Dept.	Board of Building Appeals.	None.	20 consecutive minutes each day when building new fire. Defined dense, thick black gray smoke or cinders.
Hamilton, Ohio.	52,176	Dept. of Safety.	None.	Color scale.	10 m. in any hour when fire is cleaned or built.
Hamtramck, Mich.	56,283	Health Dept.	None.	Ringelmann Chart.	6 m. in 1 hr. when cleaning fires or building new. Defined 60% or greater.
Harrisburg, Penn.	80,284	Bureau of Smoke Regulation, Geo. W. H. Roberts, Ch. Ins.	None.	Ringelmann chart—No. 3.	2 m. in 15 m.—consecutive minutes in 1 day.
Hartford, Conn.	163,818	Philip A. Mason, Building Supervisor.	None.	Ringelmann Chart—No. 3.	9 m. in 1 hr. when fire is cleaned or rebuilt.
Highland Park, Mich.	52,817	L. C. Whilsit, (City Engr.), Inspector.	Mayor may appoint board of not less than 3 members. (Dept. Public Safety).	Umbrascope.	20 m. in 1 hr. once every 24 when new fire is kindled—6 m. in 1 hr., not exceeding 2 m. of continuous emission.
Hudson County, N. J. (12 cities).		Wm. G. Christy, Smoke Abatement Engineer.	Dept. Sm. Regulation—3 engrs. —as Advisory Board. Engr. must be member A.S.M.E.	Ringelmann Chart—No. 3.	2 m. in 15 m. from stationary plants—30 s. in 3 m. from locomotives and steamboats—No. 2 Ringelmann, 4 m. in 15 m.
Houston, Tex.	289,428	Fire Marshal.	None.	None	
Indianapolis, Ind.	364,073	Fred C. Barton, Combustion Engineer, Building Dept.	None.	Density scale.	6 m. in 1 hr. when cleaning fires or building new.
Jacksonville, Fla.	129,682	Building Dept.	By ordinance.		Not over 10 m. in 1 hr., day or night.
Jamestown, N. Y.	45,172	Chief of Police.	Ordinance Committee.	Ringelmann Chart.	6 m. in 1 hr. when cleaning fires or building new.
Kansas City, Mo.	392,761	E. D. McCarty, Commissioner of Smoke Prevention.	None.	Ringelmann Chart.	5 m. in 1 hr. when cleaning fires or building new.
Knoxville, Tenn.	105,400	Thos. F. Ashe, Chief Engineer.	Bureau of Smoke Regulation—5 members (3 mechanical engineers).	Ringelmann Chart—equal to or greater than No. 3.	30 m. in 24 hrs. when starting new fires.
La Crosse, Wis.	39,614	Fire Marshal.			Any dense smoke a nuisance.
Lakewood, O.	69,811	Dept of Smoke Ins. and Regulation. E. C. Sargent, Smoke Inspector.	None.	Ringelmann Chart—No. 3.	Not over 6 m. in 1 hr.
Lansing, Mich.	78,421	Building Commissioner.	3 members—at call of Bldg. Inspector.	Umbrascope—over No. 1 considered nuisance.	20 m. in 1 hr. from stationary plants when cleaning fires or building new—12 m. in 1 hr. from locomotives.
Los Angeles, Cal.	1,231,730	Board of Health Commission, George Parrish, M. D., Health Officer.		Ringelmann Chart.	Not over 3 m.—day or night.
Louisville, Ky.	307,808	Department of Bldgs. George Mitchell, Chief Smoke Inspector.		Umbrascope.	3 m. in 1 hr.
Memphis, Tenn.....	252,049	E. S. Conser, Smoke Marshal.	Board of Commis'rs and City Smoke Com.	Ringelmann Chart—equal or greater than No. 3.	6 m. in 1 hr. when cleaning fires or building new.
Miami, Fla.	110,514	R. A. Williams, Smoke Inspector	City Manager.	Ringelmann Chart—No. 3 is dense smoke.	6 m. in 1 hr. when cleaning fires or building new.
Milwaukee, Wis.	581,078	Rein, Kunz, Chief Examiner and Supervisor, Smoke Inspector.	Department of Safety Engineering.	Ringelmann Chart.	5 m. in 1 hr. day or night.
Minneapolis, Minn.	462,611	Department of Buildings, F. E. Reidhead, Smoke Inspector.	None.	Photographic evidence only in case of conviction.	Dense smoke prohibited.
Mobile, Ala.	65,817			None specified.	10 m. allowed for cleaning or building new fires.
Mt. Vernon, N. Y.	60,869	Department of Health.	None.	None specified.	All black smoke prohibited. Burning soft coal forbidden.
Muskegon, Mich.	41,338	Fire Chief.	None.	None specified.	

in Principal American Cities

Applies to Railroads	Applies to Marine	Installation Permit Registered	Penalty	Annual Budget	Remarks
Yes.	Yes.	No.	1st offense, not exceeding $100 or 60 days imprisonment—2nd, $5 to $100 or 60 days imprisonment—3rd, $25 to $200 6 months imprisonment.	$400	Covers soot, cinders and coal docks.
		Yes, by Building Dept.	None.		
			$15 to $50 1st offense—subsequent, $100 or imprisonment not to exceed 60 days.		
Yes.			Not exceeding $150 and, or 90 days imprisonment.		
No.	River steamboats.	Yes.	Not over $100.	$3,075	
Yes.		Yes.	Not over $50 1st offense nor $100 each succeeding offense.		
Yes.			Not exceeding $100, imprisonment, or both.		Council shall formulate working code.
Yes.	Yes.	Yes.	$50 or 30 days or both.	$30,000	Inspector also has powers of health officer, engr., by consent of Advisory Board, can prepare and promulgate new abatement rules. Noxious gases, vapors, soot, fly ash, etc., declared a nuisance.
		No.	$10 to $200.		Equipment must be provided to consume smoke or soot applies to all persons, firms or corporatione
Yes.	No.	Yes.	$2 to $500.	$3,000	Firms must post $3,000 bond when installing equipment. May require tests.
Applies to locomotives.	Steamboats, tugs.		Not over $25 each offense.		Limit district; private residences excepted.
Locomotives.	Steamboat.		$10 to $100 each offense.		Includes all smoke-making equipment.
No.	No.	Yes.	1st offense, $10 to $50—2nd. $25 to $100—3rd, $50 to $100—and imprisoned 10 to 30 days	(1930-31) $10,165	Ordinance covers all smoke-producing equipment—garbage incinerators, etc.
Locomotives.	Steamboats.	Yes.	$3 to $50 each offense.	$6,500	Residences excepted at present, but revision of ordinance is contemplated to cover them and make other important changes.
Locomotives.	Boats.		$5 to $50 or imprisonment, .60 days each offense.		
Locomotives.	No.	Yes.	$10 to $100 each offense.		Inspector passes on all new work or alterations.
Locomotives.	No.		$50, imprisonment 30 days, or both.	None.	
Yes.	Yes.	No.	Not over $500, imprisonment for 6 months, or both.		Covers soot, cinders and ashes from any chimney and applies to incinerators.
Locomotives.		Yes.	$10 to $100.		Includes acids and other fumes—automatic stokers for boilers of more than 1,600 sq.ft.
Locomotives.		Yes.	$1 nor more than $50 each offense.		H.R.T. boilers over 1,600 sq.ft. to be equipped with automatic stokers. Ordinance prohibits the emission of cinders, ashes, soot, obnoxious gases.
Locomotives — Includes roundhouse stacks.		Yes.	$100 or imprisoned 30 days or both.		Inspector gets "$1 per year, payable monthly".
Yes.	Boats within 1 mile corporate city limits.	Yes.	1st offense $25 to $100 imprisonment 60 days—2nd, $50-$100 or 60 days—3rd, $100-$200 or imprisonment 6 mos.		Inspector must be steam or mechanical engineer
Yes.	Yes.	Yes.	$25-$100 each offense or imprisonment 90 days.		Acid, pungent, noxious odors prohibited. Use of high volatile coals in traction, switching and locomotive engines forbidden.
			$25 to $100 each offense.		Inferior oil in cylinders prohibited in motor-driven vehicles.
Yes.			$5-$50 or jailed 5-50 days or both.		Ordinance applies to motor vehicles; also distilling spirits, making lamp black or treating or refining metals. Emission of deleterious gas and smoke prohibited.
Yes.	Yes.		$10-$100 jailed 10-30 days or both.		New ordinance being drafted.

Smoke Abatement Regulations

City	Population 1930	Dept. Head	Advisory Board	Comparison Method	Smoke Allowed
Nashville, Tenn.	153,153	Wm. Culbert, Smoke Inspector.	Board of Public Works. Smoke Abatement Com. (7 members) advisors to Board.	Ringelmann Chart—No. 2. grade.	6 m. in 1 hr. when cleaning or building fires.
Newark, N. J.	442,770	Bureau of Smoke Abatement under Daniel Maloney, Smoke Inspector.		Ringelmann Chart—No. 3 grade.	6 m. in 1 hr. when cleaning or building fires.
New Bedford, Mass.	112,836	Fire Dept., Edw. F. Dahill, Smoke Inspector.	Mayor and Aldermen.	Dense smoke.	During 90 minutes.
Newburgh, N. Y.	31,243	Health Department.	None.	None.	Large quantities prohibited.
New Rochelle, N. Y.	54,055	Police Department.	None.	None.	Not exceeding 5 m. once in 8 hrs.; never between 8 a.m.-6 p. m.
New York, N. Y.	6,930,446	Department of Health, A Blauvelt, M. D., Asst. Sanitary Superintendent, in general charge, with 1 Chief Inspector and 10 Smoke Inspectors.	Smoke Trial Board consisting of 3 Health Department Officials.	None specified.	Dense smoke prohibited. No smoke for more than 4 minutes.
Niagara Falls, N. Y.	75,398	Bldg. Inspector and Police.	City Manager.		Large quantities prohibited—permits 8 m. in 1 hr. in good operative conditions.
Norwalk, Conn.	36,019	Commission on Smoke Regulation.	None.	Ringelmann Chart.	Ringelmann No. 3: 2 m. in 15 m. from stationary plants and 30 s. in 3 m. from locomotives and steamboats—Ringelmann No. 2: 12 m. in 1 hr. and 4 m. in 15 m. as above.
Oak Park, Ill.	63,819	L. A. McAlpin, Smoke Inspector	Bldg. Commissioner.		6 m. in 1 hr. when cleaning fires or building new.
Ogden City, Utah	40,243		None.		Dense smoke.
Oklahoma City, Okla.	185,383				No obnoxious or injurious smoke or odors permitted.
Omaha, Neb.	214,175	J. H. Craddock, Smoke Inspector.	Sm. Abate. Com'n.—5 members; 2 operating engrs.; 1 bldg mgr.; 1 architect; 1 mechanical engineer.	Ringelmann chart No. 3.	6 m. 1 hr. when cleaning fires or building new.
Pittsfield, Mass.	49,675	Smoke Inspector.	Bd. of Aldermen.		Dense smoke 5 m.—90 m. in 12 hrs.
Pasadena, Calif.	76,056	Police Department.	None.	None.	Dense smoke prohibited.
Passaic, N. J.	63,108	Department of Health, John N. Ryan, M. D., Health Officer.	None.	None.	Burning anything (other than wood, coal, paper, leaves or charcoal) prohibited.
Peoria, Ill.	104,788	Boiler Inspection Dept., F. R. Esman, Inspector.	None.	None.	Dense smoke prohibited.
Philadelphia, Pa.	1,964,430	John M. Lukens, Chief Inspector, Bureau of Steam Engine and Boiler Inspection.	None.	Color scale—No. 1 scale.	No. 1 scale smoke prohibited, except as noted under "Marine"
Pittsburgh, Pa.	669,742	Bureau of Smoke Regulation; H. B. Meller, Bureau Chief.	5 members to act as Board of appeals.	Ringelmann Chart—No. 3.	2 m. in 15 m. from stationary plants; 20 m. once a day when building new fire in cold boiler—1 m. in 8 m. from locomotives or steamboats.
Pontiac, Mich.	64,897	Building Inspector.	None.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.
Portland, Ore.	301,890	H. E. Plummer, Inspector of Buildings.	Smoke Prev. Com.—5 members; 1 mfr., 1 mech. engr., 1 sanitary engr. or physician, 1 citizen, 1 building owners' rep.	Ringelmann Chart—No. 3.	3 to 6 m. in 1 hr. when cleaning fires or building new; 15 m. in emergencies.
Providence, R. I.	252,386	Ralph W. Eaton, Smoke Inspector—Public Service Engineer ex-officio Smoke Ins. Inspector must be M.E.		Ringelmann chart—No. 3	6 m. in 1 hr. from stationary plants—1 m. in 5 m. from locomotives or 15 m. in 1 hr. when cleaning fires or building new.
Quincy, Ill.	39,221		None.	Dense smoke prohibited.	
Racine, Wis.	67,515	Sanitary Inspector or Police.		Dense smoke.	5 m. in any 1 hr.
Reading, Pa.	110,289	Smoke Inspector, Bldg. Dept.	None.	None specified.	Dense black or gray smoke forbidden.
Rochester, N. Y.	325,019	Dept. of Public Safety, A. W. Gassman, Ch. Smoke Insp.	None.	Color scale.	Dark smoke prohibited; 10 m. in 24 hr.
Rock Island, Ill.	39,093	Health Dept., Police or Health Inspector.	None.	Dense smoke.	6 m. in 1 hr. when cleaning fires or building new.
Salt Lake City, Utah.	140,184	Billeter, Asst. City Engineer in charge of smoke abatement.	Board of Com'rs of Smoke Ins. and Abatement. May appoint 4 deputies, 2 of which are engrs. Board has 7 members; not functioning at present.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.

in Principal American Cities

Applies to Railroads	Applies to Marine	Installation Permit Registered	Penalty	Annual Budget	Remarks
Yes.	Steamboats.	Yes.	$5-$25 each offense.	(1926) $10,000	Inspector must be mechanical engineer.
Yes — No firing while not in motion nor in motion until 10 exhausts.		Yes.	$100 or jail for 10 days.	$11,000	Ordinance as of May 4, 1926.
		Yes.			Up to Feb. 25, 1929: For past 7 years, no application made; no permit issued—see Revised Laws (not received).
			$50 each offense.		No further details.
Yes.	Yes.	No.	$25 each offense.		
Yes.	Yes.		Misdemeanor.		Sanitary code covers cinders, dust, gas, steam, offensive or noisome odors from any source
Yes.			$50 each offense.		Emission of cinders, soot, dust, gas, steam or any offensive odors prohibited.
Yes.	Yes.	Yes.	Not exceeding $50 each offense —every day a separate violation.		Covers fly ash and fumes. All new installations must be approved by commission.
Yes.		Yes.	$10-$100 each offense.		In bldg. insp.'s budget.
					Obnoxious odors declared unlawful.
		Yes.	Not over $100.		Has detailed plans for boilers and stacks.
Yes.			$100 each week.	$100-salary of sm. insp.	Reiers liquor licenses—must be *old*. No ordinance.
					Sec. 3 only. Emission of dust, soot, gas or any unwholesome fumes prohibited.
		None.			Sec. 10 only. Emission of obnoxious gases or odors prohibited.
Yes.	Yes.	Yes.	$10 to $100 each offense.		Ten days notice given in writing before prosecution.
Yes.	Ordinance does not apply to river steam craft in transit or entering or leaving city except while cleaning fires (10 m.) or standing or shifting (5 m.).	No.	$25 each offense.	$3,400	1904 ordinance, amended 1906 to apply to railroads.
Yes.	Yes.	Yes.	Maximum of $100 or 30 days imprisonment, or both, each offense.	$21,059	Smoke indicator in boiler room.
Yes.		No.	$10-$100 each offense.	No separate budget	
No.	No.	No.	$100 or imprisonment 30 days or both.		Covers soot, dust, ashes or cinders and applies to incinerators.
Yes.		Yes.	$10 to $100 each offense in 24 hrs.	No separate budget	State has ordinance. Accepted by City of Providence.
			$100.		
Yes.	Yes.		1st offense: $5-$100 or 60 days—2nd, $50 to $100 or 60 days—3rd or more, $100 or 6 months.		
Yes.		Yes.	$10-$100 each offense.		
Yes.	Yes (Exempts boats in transit, entering or departing).		$50 or imprisonment 50 days, or both.	$6,000	
Yes.	Yes.		$10-$100 each offense.		
Yes.		Yes.	$10 to $299 each offense.	$15,000	Ordinance as of 1925. Mechanical stokers for all H.R.T. boilers over 1,600 sq.ft.; smoke indicators on all plants above 25 hp.

Smoke Abatement Regulations

City	Population 1930	Dept. Head	Advisory Board	Comparison Method	Smoke Allowed
San Diego, Calif.	147,897	Dept. Smoke Inspection, Jos. Hazell, Boiler Inspector.	.....	Ringelmann chart—No. 3.	10 m. in 1 hr. for cleaning or new fire. Must clean chimneys.
San Francisco (City and County)	637,212	Board of Health.	None.	Ringelmann chart—No. 3.	10 m. in 1 hr. when cleaning fires or building new.
San Jose, Calif.	57,547	.....	None.	None.	.....
Schenectady, N. Y.	95,652	City Engineer.	None.	Ringelmann Chart—No. 3.	75 s. in 1 hr. when cleaning fires or building new.
Sioux City, Ia.	79,212	Supt. of Public Safety.		Ringelmann Chart—No. 3.	
South Bend, Ind.	104,066	Geo. A. Davis, Com'r. of Buildings.	Citizens' Smoke Abatement Committee—may consult M.E.	Ringelmann Chart —No.3.	Not to exceed 9 m. in 1 hr from 4:30 a.m. to 6:30 a.m. from 5 to 6 p.m. not to exceed 4 m., in cleaning or building fires.
Springfield, Mass.	149,861	J. J. Fitzgerald, Inspector.	None.	Dark or dense gray smoke.	Not in excess of 2 m. continuously or during 12% of any period of 12 hrs.
Springfield, Ohio.	68,406	Director Public Health, Detailed by City Mgr.		Ringelmann Chart—No. 3.	9 m. in 1 hr. from stationary plants when cleaning fires or building new—12 m. in 1 hr. from locomotives when cleaning or starting fires.
St. Louis, Mo.	822,032	R. R. Gordon, Com'r. Smoke Regulation (must be engr.). Inspectors must be stationary or locomotive engrs.	3 members: 1 mech. engr., 1 stationary engr. and 1 locomotive engr.	Ringelmann Chart—No. 3.	20 m. in 1 hr. for kindling fire under cold boiler or furnace; 6 m. when cleaning fire.
St. Paul, Minn.	271,418	P. J. Byrne, Chief Smoke Inspector under Commissioner of Public Utilities.	Advisory Board on Sm. Abatement—12 members; 2 women, 1 R. R. man, 2 professional engrs., 2 op. engrs.	Ringelmann Chart—No. 3.	1 m. in 6 m. or 6 m. in 1 hr. when starting new fire.
St. Petersburg, Fla.	39,504		None.	Dense smoke.	None.
Syracuse, N. Y.	207,007	Fire Captain, Smoke Inspector.	Committee on Public Safety and Chief of Fire Dept.	Ringelmann Chart—No. 3.	6 m. in 1 hr. when cleaning fires or building new.
Tacoma, Wash.	106,885		None.	Not specified.	Burning refuse, sawdust, etc., soot or gases a nuisance.
Toledo, Ohio.	290,803	Division of Smoke Inspection, John E. Carey, Sm. Inspector, M. E. or operating engr.		Color scale.	6 m. in 1 hr. when cleaning fires or building new.
Utica, N. Y.	101,740	F. J. Strobel, Sm. Inspector.	Board of Aldermen.	Color scale—No. 1—Umbrascope.	Locomotives in operation, 3 m. in 20 for cleaning or new fire between 6:00-7:30 a.m.
Washington, D. C.	486,869	Health Department, W. G. Lowell, M. D., Health Officer.	None.	Dense or thick black or gray smoke or cinders.	No time limit.
Watertown, N. Y.	32,088	Fire Chief.	Board of Public Safety.	Color scale.	Dark smoke not exceeding 5 m. Locomotives standing, shifting, moving not in excess of Scale in preparation 10 m. once in 24 hrs.—in transit, not to stop over 5 m. Does not apply between 5:00-7:30 a.m.
Wheeling, W. Va.	61,752	Smoke Abatement Com'n.		Ringelmann Chart—No. 3.	2 m. in 15 from stationary plants —1 m. in 8 m. from locomotives and steamboats, and 20 m. a day for starting new fire.
Wichita, Kans.	111,039	Fire Marshal.	Board of Commissioners.		Dense smoke prohibited.
Wilkes-Barre, Pa.	86,507				None.
Yonkers, N. Y.	135,123	M. M. Landy, Inspector.	Bureau of Combustibles.	Ringelmann Chart—No. 3.	No business or plant injurious to health permitted.

DOMINION

Hamilton, Ont.	114,151	Dept. of Health, A. C. Shain, Chief Inspector.	None.	None.	None.
Montreal, Que.	618,506	Inspector Boilers (4 men).	Fire Committee.		
Toronto, Ont.	621,596	D. Chisholm, Property Commissioner.	Board of Control.		Dense smoke prohibited after 6 m. in 1 hr. Does not apply to smelting and refining.
Vancouver, B. C.	117,217	J. McGregor, Smoke.	None.	Ringelmann Chart—No. 3.	2 m. in 15 m. and 20 m. for starting new fire.
Winnipeg, Man.	179,087	Health Dept. D. Little, Smoke Inspector.	Health Committee.	Dense black or gray smoke.	None.

in Principal American Cities

Applies to Railroads	Applies to Marine	Installation Permit Registered	Penalty	Annual Budget	Remarks
Yes.	Yes.	Yes.	Convicted on proof of misdemeanor.		
			$50, imprisonment 5 days, or both.		Covers soot, ashes, cinders and fumes from any source.
Yes.	Yes.	No.	$10-$100 each offense.	None.	No separate smoke division.
Yes.	Yes.		$10-$100 each offense.		Can divide city into districts, thus excepting kilns and other plants outside centre of city.
Yes.	Yes.	Yes.			Refers "Penalties" but does not give them. Escape of deleterious substances or gases prohibited.
			$100 for each week.	$516.70 (1928).	Acts of 1900, Part-Time Inspector.
Yes.			$10 to $100 each offense.		
Yes.	Yes.	Yes.	$25-$500 each offense. Each separate offense.	$22,908	All new installations and alterations must be approved by commissioner.
Yes.	Yes.	No.	$25-$100 or imprisonment 5 to 30 days.		Approved 1925.
Yes.			$100 or 90 days.		
Yes.	Yes.		$50 each offense.	None.	1930 ordinance.
			Not exceeding $100, imprisoned 30 days or both.		Abstracts from city clerk.
Locomotives—must have steam air jets—$25 each offense.	Yes.	Yes.	$5-$100 each day.		1922 ordinance.
Yes.	Yes.		$25-$50 in 1 day.		1925 ordinance.
No.	No.	No.	$10-$100 each offense.		Feb. 2, 1899. Excludes private residences.
Yes.			$25 each offense.		1911 ordinance.
Yes.	Yes.		$100 and costs, imprisonment 1 yr., or both.	$3,500	Applies flats—apartments with over 6 apartments —1924 ordinance.
Yes.			$100 each offense or imprisonment.		March, 1921, ordinance.
			$10 each offense.		Prohibits use of soft coal.
Yes.	Yes.				Ordinance is being revised.

OF CANADA

No.	No.	No.	Public nuisance.		Health ordinance prohibiting smoke injurious to health.
			$100 or 60 days—$50 for each additional day.	$10,000	Has Chimney Sweeping Regulations. Ordinance covers the installation of apparatus to consume smoke and gas, upon notification from Boiler Inspector.
No.	Yes.		Not exceeding $50 each offense.		
Yes.	Yes.	No.	Not exceeding $100 and costs or 2 months' imprisonment for each offense.		Does not apply to private residences nor to flats with 3 or fewer apartments.
No.	Yes.	No.	Not exceeding $50 and costs each offense.		

READERS' COMMENTS

Maintaining Proper Feed-Water Conditions

YOUR EDITORIAL of Aug. 4, "Wanted—A Feed Water Moses," is particularly interesting. With the results of 15 years' experience, and over 150 installations, we have found that if the following average condition is maintained in the boiler troubles will be eliminated:

4 Gr. per gal. of caustic alkalinity
8 Gr. per gal. of non-caustic alkalinity
5 Concentrations in the boiler.

This is the average and will fit any plant, but is also somewhat flexible for a particular plant.

The only tests required to check this condition are the simple phenolphthalein and methyl orange titration tests that can be made in a few minutes by a man who need not even know what they mean. We have never seen a single case of caustic embrittlement where this condition was maintained. J. B. SWIFT.

Watertown, Wis.

Engineers As Inventors

THE EDITORIAL, "Engineers as Inventors," in the Sept. 1 number is pertinent because among the many remedies presented for our industrial illness is the one of advancing new creations to absorb capital and labor. The fact that only a small percentage of engineers have inventions and patents to their credit deserves more attention than it is likely to receive until the present generation of business men have passed.

What Dr. Rossman says regarding the tendency of engineering courses to smother creative work will be affirmed by those of us who during our engineering experiences have spent an appreciable time on the staff of an engineering college. But although college schedules do not permit much original work, the colleges are not to blame. They have become factories producing a mass of semi-finished material according to the specifications of industry. On industry is the burden of responsibility.

Looking back over years, in shop, in college and in industrial laboratories, to contacts with a truly original and creative mind, the cause for the small percentage of inventive engineers stands out vividly. An analysis of this situation can be made, and supported by facts, with all the concentration and directness of an engineering report. But in the chancelleries of industry the greater part of such a report would be accepted as blasphemy against industry.

The inventor still requires a better and safer market for his products. In his recent book, "The Masquerade of Monopoly," Dr. Frank A. Fetter of Princeton says: "A capitalism without equal freedom of markets and of commerce is a system of hypocrisy." And the importance of the relevancy of this statement to the inventing situation is not solely in that the inventor's market is circumscribed and manipulated by the schemes of industrial organizations, but that there is an increasing number of inventors who know it.

Industrial laboratories often seek to take advantage of the ambitions of inexperienced college graduates by trying to harness their creative minds to corporation plans. But the creative mind is inherently imaginative, and no mind is more sensitive to restraint and dictation. And so even among youthful engineers there is a growing consciousness of industry's regarding them simply as technical mechanics.

The colleges cannot be blamed for examples such as the following, which may help explain why many colleges are now stressing business courses more than heretofore—something to get their graduates, without violation of industrial specifications, nearer to the money than do purely technical courses: On the one hand, there was an official of a large corporation who in 1929 received a bonus of over one hundred times his salary; and on the other hand, about that same time, an official of a larger corporation declared against conspicuous rewards for inventors, stating that a moderate salary increase should be sufficient reward. In the face of such procedure any attempt at an elaborate explanation for an unexpected absence of invention among engineers appears somewhat unnecssary.

Why profits are considered essential in business, yet incentives not considered essential for inventors, bespeaks a mentality capable of evolving just what we are now enjoying, a leisurely business slump. Ideas are the product of individual minds, not of systems. No organization can ever produce ideas. Some organizations cannot even grasp the fact that new ideas are the foundation of human progress.

Bolton, Ontario. ROBERTSON MATTHEWS.

The Navy's Attitude Toward American Diesels

IN AN ARTICLE in the July 7 number entitled "The Navy's Attitude Toward American Diesels," L. H. Morrison directs attention to the massive construction of floor-plates used in the building and testing of diesel engines for submarines, and the vastly different conditions existing when these engines are operating. This conservative attitude of the diesel engine builder in various parts of the world is difficult to understand, for in the automotive industry, while the fullest use is made of the rigid test bed, the value of the test chassis is fully appreciated and the engine can be thoroughly tried out under something closely approaching working conditions.

That the American marine diesel engine builder should adopt a similar method of testing, Mr. Morrison clearly indicates, and the use of a test bed of a similar design to the actual engine bed constructed on the submarine would undoubtedly prove of much value to the designers. Cooperation between the engine builder and the navy could also produce a more satisfactory foundation for the diesel engine when installed in the submarine, as a greater use could be made of cold-drawn steel tubing, either in the construction or in the strengthening of the engine base. This tubing fulfills all requirements as to strength, rigidity and lightness.

It should be remembered that the diesel engine calls for the highest standard of workmanship and machine tools to aid in its construction and satisfactory operation. Unless the points mentioned by Mr. Morrison in his article receive the attention merited, all the efforts of the machine tool builder will be unavailing.

Glasgow, Scotland. DONALD RAEBURN.

FROM AMONG READERS' PROBLEMS

Conducted by

L. H. MORRISON

VOLUMETRIC EFFICIENCY OF AN OIL ENGINE—*What is meant by the volumetric efficiency of an oil engine?* D. J.

The volumetric efficiency is the ratio of the volume of fresh air entering the engine cylinder when reduced to atmospheric pressure and 60 deg. F. to the volume of the piston displacement plus the clearance volume.

Air entering the cylinder is at a pressure somewhat below atmospheric, due to the pressure drop in the piping and valve opening. In addition the air is heated to around 150 deg. F. through the absorption of heat from the valve body and from the cylinder walls.

PURGING OF CONDENSERS—*We have considerable air in our refrigerating system, for the head pressure is about 25 lb. higher than the pressure corresponding to the ammonia temperature at the condenser outlet. We purge often, but I fear our purge connection is at the wrong place.* C. R.

The usual manner of purging is simply to open a valve at the top of the condenser and allow the gases to pass into a pail of water. Careful engineers make a point of stopping the compressor and keeping the cooling water on the condenser from half an hour to several hours before purging, the idea being that all the ammonia will be condensed and only the inert gases will remain. This is an improvement on the first method, yet it is becoming better known every day that a large amount of ammonia is lost through the purge valve.

This loss of ammonia is due to the fact that the law of partial pressures and the law of diffusion hold for ammonia as for a mixture of perfect gases. This means that the only advantage of running water on the condenser and stopping the compressor is to cool the mixture of gases and condense out some of the ammonia. This reduces the vapor pressure of the ammonia and thereby decreases the ammonia percentage in the mixture volume purged.

The lower the temperature in the condenser the greater will be the percentage of ammonia condensed. To reduce the loss of ammonia vapor which escapes with the air in purging an extra header above the condenser with which all the coils connect may be used. Into this header is run a liquid line, so that a small amount of liquid from the receiver is expanded into the header. This cools the ammonia gas and reduces the loss.

To remove the foreign gases a line is led to a bucket filled with water. The gases will bubble up through the water, but as soon as much ammonia escapes it will give out a cracking noise in the water.

At present there are several purgers on the market which automatically remove the foreign gases.

TESTING BOILER FOR LEAKS—*Is there any practical way of locating leaks in water-tube boilers other than by use of the hydrostatic test?* E.F.P.

A method of locating leaks that has been used satisfactorily is as follows: The boiler is shut down and allowed to cool off, then it is well cleaned externally so that the inspection can be made in the proper manner. A connection is made between the compressed-air line and the boiler by removing the plug in the automatic drumhead stop and check valve and connecting a hose at this point.

With the air pressure on the boiler the inspector can not only examine the tubes and tube ends, in the header, mud and steam drums, but he can also test the steam gage, high and low water alarm and the gage cocks. If any repairs are needed they can be made and checked up without firing up the boiler to be sure they are right. This will often avoid a shutdown after the boiler has been put back into service.

NOISE IN SHAFT GLAND—*The shaft gland of a small, high-speed auxiliary turbine in our plant is provided with soft braided metallic packing. Occasionally a popping noise seems to come from this part of the turbine. What is causing it?* M.A.K.

The noise is probably caused by drops of water coming through the gland with the steam. These are sometimes reevaporated by frictional heat and produce an explosive sound. This is perfectly normal and indicates no real trouble. It usually occurs when the glands are tight and in good condition, gradually disappearing in time.

PREVIOUS QUESTION DISCUSSED BY READERS

THE QUESTION

CAN static electricity be prevented from forming in belts? It can be drained off by mounting a grounded metal comb near the belt, but in the presence of explosive fumes and dust it is desirable to prevent the creation of static. If any readers have solved this problem I should appreciate learning of their experience. S.W.A.

I ADVISE S.W.A. to procure a copy of the pamphlet "Belt Dressings for Eliminating Static" from the Bureau of Chemistry and Soils, United States Department of Agriculture, Washington, D. C. This pamphlet describes the research and tests made to devise suitable static-eliminating belt dressings. We tested the presence of static on three of our belts with a Detecto-Lite static tester. Two of the belts are 6-in. Balata, one open and one crossed; and the other is a 6-in. leather.

According to the pamphlet, a good rubber-belt dressing can be prepared by mixing 18 parts of lamp black with 82 parts of good spar varnish. The dressing must dry on the belt before it is run.

A non-flammable thinner for the varnish can be prepared by mixing equal volumes of carbon tetra-chloride and varnish-maker's and painter's naptha.

A non-static leather-belt dressing consists of 100 c.c. of liquid fish glue, 80 c.c. of glycerine, 100 c.c. of sulphonated castor oil, 170 c.c. of water, 82 grams of lamp black and 20 c.c. of 2 per cent ammonium hydroxide. The glue and glycerine are heated 1.5 hr. at 110 deg. C. (230 deg. F.). The 2 per cent ammonium hydroxide must not be added until after the water has been mixed with the glue and glycerine. These proportions may not be the best for all conditions. In some cases better results may be obtained by increasing the quantities of fish glue and glycerine. It may be applied easily with a brush while the belt is moving. It is not necessary for the dressing to dry before running the belt. If the belt has not been properly maintained this dressing will cause it to stretch.

A coat of the first dressing was applied to the two Balata belts, but the tester still indicated the presence of

static. A second coating was applied covering the belt entirely, which made one coat on the top side and two coats on the friction side. The static tester then showed the absence of static on the open belt. The crossed belt, however, still carried static charges. From this experience, it is believed that probably this dressing will not entirely relieve a crossed belt of static. However, we propose further application of the dressing. Incidentally, this dressing apparently increases the coefficient of friction between the belt and pulley.

One coat of the second dressing was applied to the leather belt. Tests showed the presence of static and the belt gave trouble by slipping. A second coating of dressing was applied and static was still found to be present, but in smaller charges, as shown by the decreased intensity of light given off by the bulb of the static indicator. The belt also slipped after the second application of the dressing. The belt is old and dry and in very poor condition. It is intended to treat the belt thoroughly with a good dressing and make further tests with the non-static dressing.

The dressings form a conductive coating that removes or neutralizes static charges. It is important that the machine or shafting be adequately grounded. Our work with these dressings has not progressed sufficiently for me to speak authoritatively on their merits. The indications are, however, that they will prove satisfactory. The pamphlet previously mentioned cites several instances of complete success.

JOHN G. CHRISTFIELD.

Parlin, N. J.

—◆—

THE REMOVAL of static from belts is a difficult problem where there are concrete floors in the plant. Concrete is more or less an insulator, and often acts as a condenser. If an appreciable amount of static electricity is stored in a machine's foundation serious results may be caused if the conductor from the metal comb at the belt is not properly insulated to the point where it is grounded from the machine.

At one plant, some years ago, we had trouble with static. The conductor from the comb was grounded on the steel reinforcing bars in the concrete. Anyone touching the guard rails around the motor received a shock. We had to insulate the guard rail from the concrete base and carry off the discharge through a well-insulated conductor run out into the yard and solder to a copper plate, which was then buried in the earth and periodically moistened.

S. ROSENBERG.

New York City.

—◆—

SOME YEARS AGO our lighting system became charged with static so badly that the employees could not turn the lights on or off without receiving a severe shock. It was found that the conduit, with four wires inside, was being statically charged from the belt of a motor driving the elevator. I was able to overcome this trouble by once every month applying castor oil with a brush on the outside of the belts while they were in motion.

WILLIAM SIMPSON.

Philadelphia, Pa.

—◆—

IN OUR woodworking shop there are a great number of narrow belts and pulleys running at high speed that gave trouble from static charges. When the narrow belts and pulleys were replaced with wider ones and kept in good condition the static troubles were eliminated.

Belting and pulleys, their installation and operation frequently do not receive the attention that they should and are much abused. Most shops do not have a man who knows what should be used on each installation. I believe static is only the result of improper belting condition. Common grounding of all metal parts will eliminate static even when belts slip.

WALTER L. CONROY.

Muskegon Heights, Mich.

—◆—

TO AVOID conditions favorable to static in belts, rosins and similar adhesives should not be used on them. Less static is found on belts working in humid air than those operating in dry air. To eliminate static charges in belts ground all metal parts in contact with them that are likely to be charged. Impregnate the belts with glycerine. Before treating the belt clean it with gasoline or benzol. A mixture 50 parts of glycerine with 50 parts of water should be applied with a sponge on the outside of the belt once a week. The hygroscopic qualities of glycerine provide sufficient humidity to act as a conductor and neutralize the static. In some cases train-oil or lard from seals has proved successful, applied on both sides of belt once a week. Metal coating of belts has also been tried, but failed on account of insufficient durability.

For a continuous indication of belt static a Neon-filled lamp can be used, with one terminal grounded and the other one held close to the belt. At low tension only the spiral will start to gleam, whereas at higher tension the gas will glow red. The best place for such a test is the slack side of belt near the driving pulley.

H. W. SACHS.

Binghamton, N. Y.

—◆—

ABOUT sixteen years ago I was connected with an industrial plant where static electricity was evidently the cause of a number of fires in a department where the dust hazard was great. Investigation showed that the belt drives were not the only source of static. It was found that the steel chutes to the storage bins were statically charged, due to the friction of the materials on them.

It was necessary to thoroughly ground all parts of the equipment. On the belt drives it was necessary, in addition to the grounded metal combs, to use a belt treatment composed of about half glycerine and half water. An application weekly, together with the grounded combs, practically eliminated the static on the belt drives.

The use of paper composition pulleys, wood pulleys, and some makes of belt dressings, accelerated the building up of a static potential. It was found that the oil film of an ordinary babbitt lineshaft bearing was sufficient insulation to allow building up a potential on the shaft. To prevent this a ground brush was used on all sections of lineshafting. By maintaining good ground connections and by treating the belts we overcame our troubles with static electricity.

GUY L. WARDEN.

Los Angeles, Calif.

—◆—

BELTS should not be used where there are explosive fumes and dust. Instead speed reducers or chain drives should be applied. If belts must be used, all pulleys should be of steel or cast iron, with no covering, and copper rings and brushes should be placed on the shafting and thoroughly grounded.

Artifically humidifying the atmosphere in the room will prevent the formation of static on belts. Permitting a small discharge of steam into the air will reduce the danger from static. Or, better still, seal the room and install an air-conditioning unit. Any procedure that will keep the air damp will be a step toward preventing static charges on belts.

Chicago, Ill. S. E. NICHOLS.

A Question for Our Readers

GROUND CONNECTIONS are used for various purposes on power systems. Sometimes these are an important part of the protective equipment, and if not maintained in good condition serious damage may occur to circuits and equipment. I should like to hear from readers of Power *how they determine if ground connections are in good condition, how frequently they test them and what they do to maintain them at a low resistance.*

E.E.C.

Suitable answers, if received promptly, will be paid for[1] when published

▼

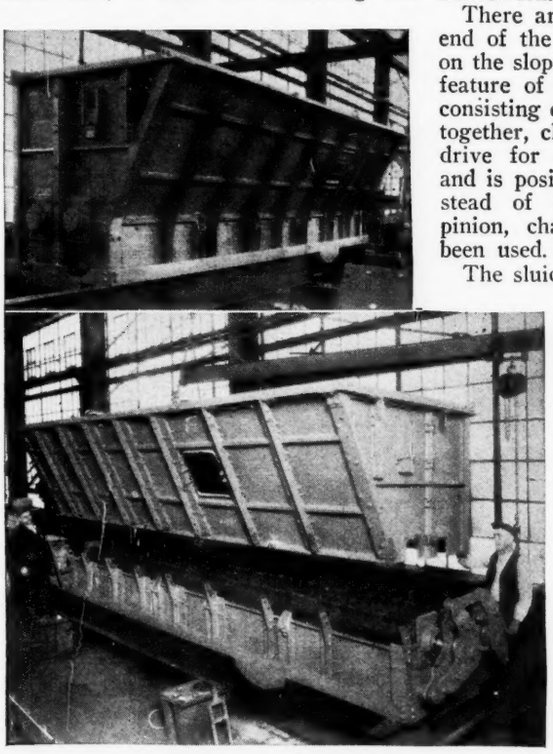
[1]As an alternative to cash payment for answers published, readers may select any one of the following books. (Be sure to state the book desired.):

Morrison's *American Diesel Engines;* Walker and Crocker's *Piping Handbook;* Norris and Therkeisen's *Heat Power;* Emswiler's *Thermodynamics;* Church's *Steam Turbines;* Uehling's *Heat Loss Analysis;* Croft's *Steam Power Plant Auxiliaries and Accessories;* Powell's *Boiler Feed Water Purification;* Osborne's *Power Plant Lubrication;* Moyer and Fritz' *Refrigeration;* Rietschel-Brabbee's *Heating and Ventilation;* Annett's *Electric Elevators.*

WHAT'S NEW IN PLANT EQUIPMENT

New Ash Hopper with Auxiliary Feeder Rolls for Use Over a Sluice

WITH a view to eliminating some of the difficulties heretofore encountered in the sluicing of ashes from underfeed stokers, the American Engineering Company, Philadelphia, Pa., has developed a new ash hopper for use over a sluice. The hopper is designed to discharge the ashes to the sluice in the proper condition for effective sluicing and at a constant rate, a rate not exceeding the quantity which the water in the sluice can dispose of.



Ash hopper assembly and ash hopper and feeder roll sections about to be bolted together

The upper view shows the hopper complete and the lower view the ash hopper and auxiliary roll section ready to be bolted together.

Although similar in appearance, the auxiliary feeder rolls shown in the lower view are not to be confused with the stoker crusher rolls. They are sufficiently powerful to crush clinker and can do so in an emergency, but their principal function is to feed the ash to the sluice at a constant rate. Less than 5 hp. is required to drive the feeder rolls.

The stoker crusher rolls are driven by a Hele-Shaw hydraulic pump and ram connected to a ratchet-and-pawl mechanism. The auxiliary rolls are driven in the same way. This type of drive lends itself to synchronization of the feeder and crusher rolls, an important advantage when it is desired to make disposal automatic. Synchronized, the feeder rolls start discharging as soon as the crusher rolls move.

The hopper is fabricated of $\frac{1}{2}$-in. cast-iron plate sections which have overlapping, interlocking edges on all four sides, drawn tight by bolting to a steel framework.

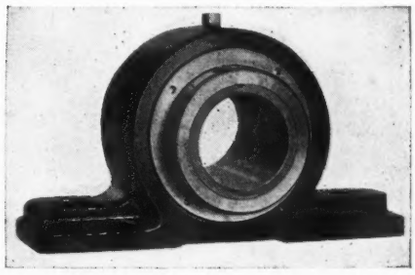
There are observation doors at each end of the hopper and an access door on the sloping side. Another important feature of the hopper is the gas seal, consisting of a pair of gates which slide together, closing off the opening. The drive for the gates is hand-operated and is positive in either direction. Instead of the conventional rack and pinion, chains reeved to spools have been used.

The sluiceway is directly beneath the hopper feeder rolls and runs parallel to the stoker crusher rolls. The sluiceway liners are made of chilled cast iron and are set in a concrete trench, the top of which is level with the basement floor and of a depth depending on the length of the sluiceway. The trench itself is covered by removable cast-iron coverplates resting on curb angles imbedded in the sides at the floor level.

Some of the advantages of the new ash hopper outlined by the manufacturer are: positive discharge of ash with no danger of plugging the sluice; saving in high pressure water; synchronization of crusher and feeder rolls; can be used with underfeed, overfeed and chain-grate stokers or readily adapted for pulverized coal; prepares ash for pumping to fill; and very little attention required, which makes remote control possible.

Self-Aligning Roller Bearings

AN ENTIRELY new line of self-aligning roller bearing units for normal-duty applications has recently been announced by the Shafer Bearing Corporation, 6501 West Grand Ave., Chicago, Ill. Double-row self-aligning roller bearings as used in the standard-duty units are now available in these lighter-weight, compact, simpler housings, which are furnished as pillow blocks, flange units and take-up units, in a full range of shaft sizes from $\frac{3}{4}$ to 3 inches.



Roller bearing pillow block

The inner race of the bearing is extended on one end only and fastened to the shaft by a special locking collar. The sealing of the normal-duty unit is accomplished by a grease seal consisting of two steel stampings pressed into the housing or cover. Between these stampings is a $\frac{3}{32}$-in. fiber washer which will be a slip fit on the extended cone.

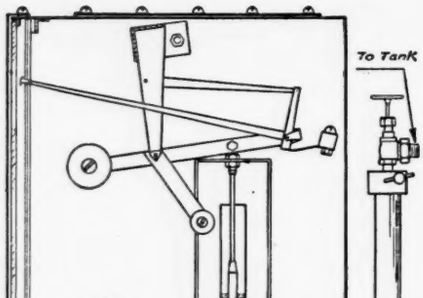
The flange unit may be bolted to the side of a machine frame of cast-iron or structural steel without machining, as the self-aligning feature compensates for moderate inaccuracies of mounting. It can also be used as a step bearing for vertical shafts. Flange units are available in shaft sizes from $\frac{3}{4}$ to 3 in.

The new take-up units are suitable for conveyor work or any normal-duty applications where a belt take-up bearing is required. Shaft sizes range from $\frac{3}{4}$ to 3 inches.

Liquid-Level Gage Uses Straight-Line Movement

A LIQUID-LEVEL GAGE for elevated tanks vented to the atmosphere has been developed by the Ellison Draft Gage Company, Chicago, Ill. A mercury U-column is used to measure directly the liquid head or static pressure corresponding to varying liquid levels in the tank, balancing an equivalent column of mercury against the liquid head obtaining. One leg of the U-column terminates in an indicating pointer gage having a mechanism known as the Ellison straight-line movement. When the liquid pressure is exerted on the mercury column the mercury is depressed in the reservoir, rises through the small tubing and flows into a well in the gage.

Movement of the mercury in the well actuates a plunger attached to the beam. The pointer gives a true indication of the liquid level over the entire range of a straight-line scale of uniform spacing. Scales read directly in feet or in frac-



Section through Ellison liquid-level gage

tional levels between full and empty tank, as specified. The mercury column is furnished with a needle valve for ⅛-in. connection to tank, vent and drain. The column is designed to require about 5 lb. of mercury, depending upon the range and the head to be measured.

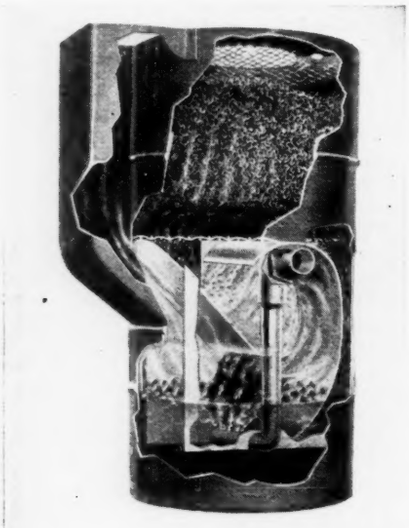
Illuminated from the interior, the gage may be mounted on a panel flush or semi-flush, or on the wall with vertical or tilted scales to obtain the best visibility. It can be furnished also in multiple units for two or more tanks with the pointer movements in a common case and compact header arrangement of the mercury columns.

Oil-Type Air Cleaner

In the imperial air cleaner put out by the United Air Cleaner Corporation, 9705 Cottage Grove Ave., Chicago, Ill., for use on compressors and other internal combustion engine-driven equipment part of the exhaust gases are used to create an oil spray for washing the air.

The exhaust gases enter the bottom compartment of the filter through a slotted pipe and set up a turbulence in the oil, causing the washing chamber immediately above the oil level to be filled with a spray of finely divided oil particles. Outside air entering this chamber must pass through the spray and be deflected by two specially shaped baffles. The combined action of the oil spray and series of baffles washes the air thoroughly, and the baffles deflect the dust particles down the sides of the chamber into the reservoir.

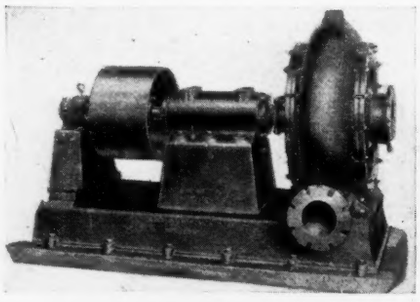
When the air leaves the washing chamber it enters an upper compartment packed with a filter of fine crimped wire. In this compartment any oil particles are removed from the air and returned to the reservoir by means of passages around the outer shell of the cleaner. Ordinary crankcase oil may be used.



Cutaway view of filter

Abrasive-Materials Handling Pump

The illustration shows the new Type C centrifugal pump brought out by the American Manganese Steel Company, Chicago Heights, Ill., especially for handling abrasive materials. The bearings are interchangeable in the field, either sleeve or anti-friction types being available. Lubrication is required only on the main bearings, except where outboard bearings are used. The impeller clearance and main bearings can be adjusted without dismantling the pump, and the bearings and bearing supports have been designed to absorb all thrust and radial shocks.



Type C manganese steel pump

Vari-Speed Motor Pulley

Two types of the variable-speed motor pulley now being put out by the Reeves Pulley Company, Columbus, Ind., are illustrated. The smaller capacity pulley, ⅓ to 1 hp., is shown in the upper view and the 1 to 7½ hp. pulley in the lower view.

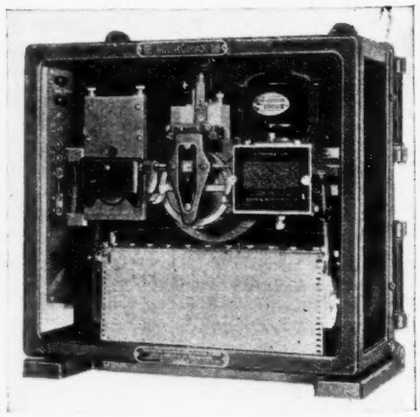
The pulley consists, essentially, of an assembly of two opposing cone-faced disks, one stationary and one sliding, and an adjustable power compression spring, all of which is self-contained and mounted on the motor shaft. The motor is mounted on a special base fitted with an adjusting handwheel by means of which the motor may be moved forward or backward. In the smaller size a specially constructed rubber belting is used. The edges of the belt are bevelled to fit the angle of the driving disks and the bottom side transmits the power to the driven pulley. In the larger sizes a double-block center-pull V-belt of cord construction rubber is used. Edges of the blocks are leather tipped and the lower sides are surfaced with chrome leather.

Motor pulleys in capacities of ⅓ to 1 hp. and 1 to 7½ hp.

Variations in the speed of the driven pulley are obtained by simply turning the handwheel, moving the motor closer or farther away from the driven pulley. The movement of the motor causes the V-belt to assume a larger or smaller diameter between the cone-faced disks, the outer disk moving laterally on the shaft. Driving pressure on the belt is maintained in all positions by the adjustable compression spring mounted on the outer end of the shaft as shown. The pulley is built in six sizes and the speed ratio is 3 to 1.

Improved Potentiometer Pyrometer

Introduction of an improved potentiometer pyrometer has been made by the Leeds & Northrup Company, Phila-



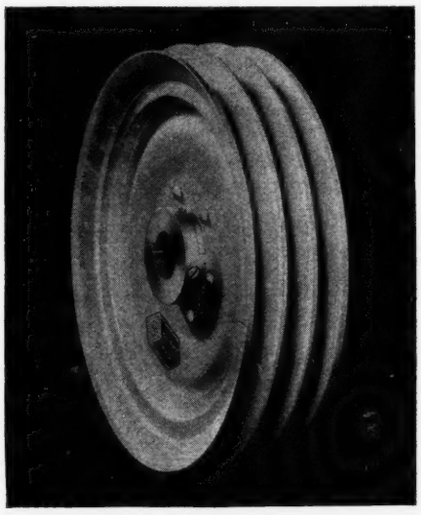
Micromax improved pyrometer

delphia, Pa. The instrument has been given the name of "Micromax" to distinguish it from the preceding models. The new instrument is said to be more sensitive, faster in operation, fully automatic and designed to eliminate daily attention and adjustments. These advantages are obtained by the use of a new mechanical balancing device, and an automatic standardizer which checks the instrument every 45 min. or less.

The balancing device is said to give micrometer sensitivity and to require no adjustments. The automatic standardizer is a simple device which automatically checks the potentiometer circuit every 45 min. or less, giving a much closer adjustment than is obtained by hand. Also, the circuit can be standardized at will (as after changing a thermocouple, when a check is desired) before the 45-min. cycle is completed. Recorders now in operation may be equipped with Micromax improvements.

Light-Weight Sheaves for V-Belt Drive

TO MEET the demand for a light-weight, low-priced drive, the Allis-Chalmers Manufacturing Company has brought out a new pressed-steel Texrope sheave, and complete Texrope drives using these



Pressed-steel sheaves for Texrope drives

sheaves are now available. The sheaves are die-pressed and then each section is welded both at the web and at the rim to eliminate vibration and noise and to give accurate balance. They are manufactured in a large range of diameters, permitting ratios as high as 6 to 1.

Proportioning Motor Control System

WHAT is claimed to be a radically different control system from any existing is announced by the Minneapolis-Honeywell Regulator Company, Minneapolis, Minn. The apparatus incorporates a combination of two parts, the electrical

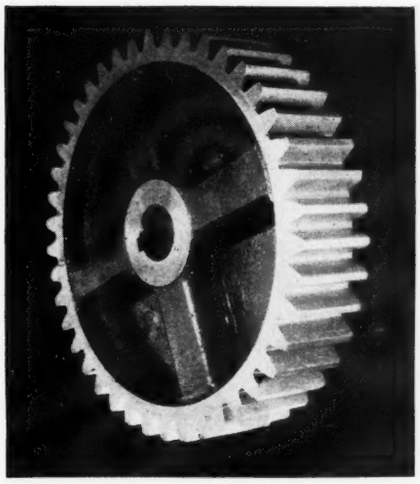
Power unit of the motor control system

transmission system and the associated power unit, which can be adjacent to or remote from the controlling instrument. No mechanical interconnection is required between the power unit and the electrical balancing mechanism. The transmission system operates on the Wheatstone Bridge principle.

The power unit, inherently a motor-driven speed reducer, causes its drive shaft to take a new position whenever the conditions under control (such as temperature) change slightly. If a device such a valve, louver or rheostat is driven by the motor, then its operation tends to correct the change, and the condition of equilibrium is approached. The apparatus may be used in conjunction with practically all types of control instruments, and in the control of such services as temperature, pressure, humidity, liquid level, rates of flow, stoker or pulverizer feed.

Welded Steel Gears

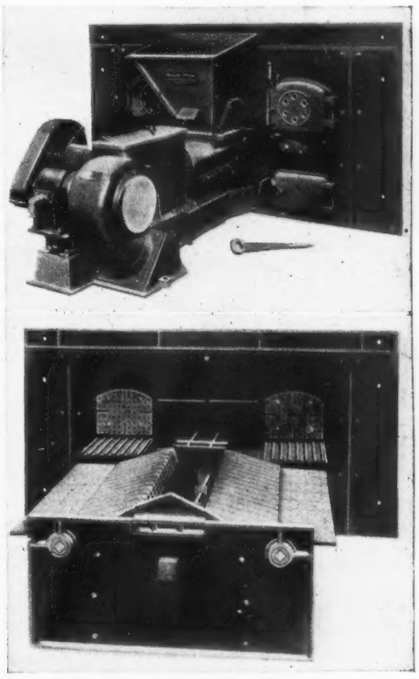
WELDED STEEL GEARS ranging in diameters from 15 to 168 in. and especially adapted to heavy-duty service are now being put out by the Philadelphia Gear Works, Erie Ave. and 9th Street, Philadelphia, Pa. The gears are made from rolled steel sheet. The rim is cut in the form of a solid ring from a flat plate by means of a gas torch. A solid steel disk forms the web of the gear, against which channel-shaped steel arms are welded. The hub is a forged-steel bar drilled to receive the shaft. The entire line of cast-steel gears put out by the company, including spur, helical, herringbone, bevel, internal, spiral and continuous-herringbone gears, is now available in welded-steel construction.



Welded gear for heavy-duty service

Unit-Type Single-Retort Underfeed Stoker

ESPECIALLY DESIGNED for burning all grades of bituminous coals, both coking and non-coking, the McClave junior unit-type underfeed stoker illustrated is built in sizes suitable for heating boilers and small industrial boilers ranging from 350 to 1,500 sq.ft. of heating surface.



Front and rear view of McClave junior stoker

Referring to the illustration, which shows a front and rear view of the stoker, the forced-draft fan and stoker drive are combined in a compact unit. The fan is mounted on one end of the motor shaft and the stoker is driven from the other end through a silent chain and completely inclosed reduction unit.

Coal is fed to the single retort of the stoker by a ram fitted with an adjustable connecting rod, giving a ready means of regulating the amount. In the retort the coal is distributed by shoes operated from an extension on the bottom side of the ram. The stroke of the shoes is also adjustable.

The grate surface is composed of heavy sectional retort tuyères and sectional side ash-dump plates. Special sectional expansion cast-iron front and sectional front retort replaceable arch plates to support the front wall of the setting are also furnished.

NEWS of the FIELD

Texas-Chicago Natural Gas Pipe Line Completed; Has Ten Compressor Plants Totaling 71,250 Hp.

Six 12-in. pipe lines were used in the 22,000-ft. crossing over the Canadian River

CONSTRUCTION of the world's largest natural gas pipe line, extending nearly 1,000 miles from the rich gas reserves of the Texas Panhandle to the Chicago metropolitan area, has been completed and natural gas will soon be made available to consumers in Chicago and Illinois.

The line is 24 in. in diameter, and has a maximum daily capacity of 175,000,000 cu.ft. of gas. It traverses six states—Texas, Oklahoma, Kansas, Nebraska, Iowa and Illinois— and crosses thirteen important rivers which include the Canadian, the Arkansas, the Des Moines and the Mississippi. Gas will be transmitted at a pressure of 600 lb.

Because of the length of the line, it was necessary to construct ten compressor stations, having a combined capacity of 71,250 hp. They are approximately 95 miles apart, and are located near Fritch, Tex.; Gray, Okla.; Bloom, Heizer and Glasco, Kan.; Beatrice, Neb.; Hastings, Truro and Harper, Ia.; and near Geneseo, Ill. The initial station at Fritch is the largest gas-driven compressor station in the world. It consists of twelve units of 1,250 hp. each.

The line taps a reservoir of 1,000,000 acres of "sweet gas" land in the Texas Panhandle in Carson, Moore, Gray and adjacent counties. The gas reserve is estimated by geologists at 8,000,000,000,000 cu.ft., which is sufficient to supply the projected needs of Chicago for fifteen years. "Sweet gas" is pure and does not require any refining process.

The whole project represents total assets of approximately $100,000,000. It was formally launched in June last year by Henry L. Doherty & Company, which is the directing interest in the Cities Service Company. The construction was handled by the Continental Construction Company of Kansas City, in which the Doherty firm is said to have large interests.

The line was built by the Natural Gas Corporation of America. This concern is jointly owned by seven leading utility companies. The ownership is distributed as follows:

Insull Utility interests, 25 per cent; Cities Service Company, 25 per cent; Standard Oil of New Jersey and its affiliate, Southwest Development Company, 12½ per cent each; with the remaining 25 per cent interest divided among the Texas Corporation, Phillips Petroleum Corporation, Skelly Oil Company and Columbian Carbon Company.

In the Chicago area the gas will be distributed by the Peoples Gas Light and Coke Company. Connections have also been made to supply Ottawa, Streator and other cities in northern Illinois.

Seek Sale of Muscle Shoals Without Congress Approval

AROUSED BY NIBBLES from three large chemical companies not previously interested in Muscle Shoals, somebody on President Hoover's Commission went fishing in earnest last week to discover whether the property could be disposed of without further legislation by Congress. Evidently satisfied that law already on the books will permit Mr. Hoover to close a deal for the lease of Dam No. 2 and the sale of other property on the government reservation, the commission, it is reported, is seeking an opinion from Attorney General Mitchell to confirm that of its own lawyers.

The story is that the three companies now reported by Col. J. I. McMullen to be negotiating with the Commission, would like to take on Muscle Shoals but are deterred by the fear of becoming embroiled in politics. Anxious to please customers that understandably enough would not relish a grilling by Congress, the commission dug up a copy of the Act of July 9, 1918, which authorizes sale by the President of war supplies and of plants and factories acquired after April 6, 1917, for the production of such supplies.

However, there are some practical difficulties in the way of this procedure. Surplus war property can not be sold by negotiation, it must be advertised. Even if one of the chemical companies put in the best bid, the commission would probably find itself in much the same predicament as it is now. Congress would be sure to step in if there was the remotest suggestion that President Hoover intended to act without its specific authority.

Annual Safety Congress At Chicago, Oct. 12-16

DESPITE unsettled economic conditions, everything points to a record attendance of approximately 7,000 delegates to the twentieth annual safety congress and exposition to be held in Chicago, Ill., Oct. 12-16, the National Safety Council has announced. The congress, with headquarters at the Hotel Stevens, will have a total of 130 sectionalized sessions and 350 safety authorities are on the roster of speakers. Safety experiences will be exchanged and new plans launched in practically every known branch of accident prevention work.

Among the well known speakers at the opening session will be Samuel

Insull, Jr., of Chicago and H. B. Walker, president of the American Steamship Owners' Association of New York.

The various sectional-sessions, to be "staggered" throughout the week, will include automotive, cement, chemical, child education, community safety, construction, delivery, taxicab and bus, electric railway, fire prevention, food, foremen's forum, home safety, industrial health, industrial nursing, laundry and dry cleaners, marine, metals, mining, packers and tanners, paper and pulp, petroleum, power press, public utilities, quarry, refrigeration, rubber, textile, and woodworking and lumber manufacturing.

N. Y. Power & Light Buys Two Industrial Plants

TWO HYDRO-ELECTRIC STATIONS at Schuylerville and Victory Mills, N. Y., were purchased recently by the New York Power & Light Corporation and have started operations. These plants were formerly owned by the American Manufacturing Company, and supplied power for that company's operations, but have been idle since that company ceased operations several years ago. The machinery has been reconditioned by the power company engineers and a steel outdoor substation of modern design has been erected.

The generating stations on Fish Creek have a total capacity of 4,100 kva. The upper station located at Victory Mills has a rating of 1,600 kva., and is the older of the two stations. Both will be operated as units of the Niagara-Hudson system. E. W. Litchfield, superintendent of the New York Power & Light hydro-stations in the Greenwich area, with headquarters at Schaghticoke, will be in direct charge of these stations.

A. S. M. E. Reports Progress On Wire Rope Research

THE A.S.M.E. Wire Rope Research Committee announces that good progress is being made in its effort to develop an accurate method for determining the life of wire rope in service. Many users of wire rope are cooperating by providing service data and samples of discarded rope which the Bureau of Standards at Washington is testing according to an agreed upon schedule. The Engineering Foundation is financing the tests. Through the collection and correlation of such data on ropes in all classes of service the committee expects to establish a basis upon which to formulate a satisfactory wire-rope inspection method.

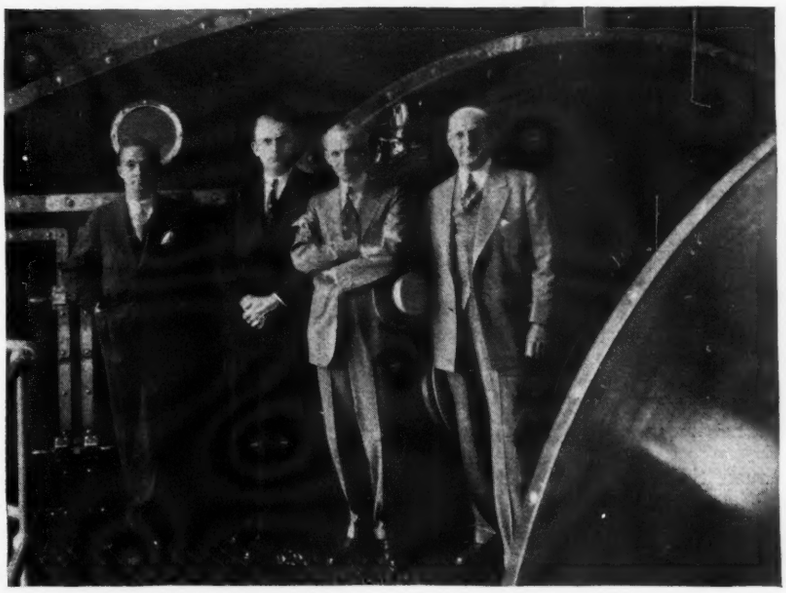
Due to limited knowledge of the factors governing wire-rope life and of their relative importance ropes are generally discarded before their useful life is up. For the same reasons wire rope is not more widely applied to new uses. It is the committee's belief that a definite relation can be established between the number of broken wires and the wear in a rope and its remaining useful life. To test this opinion several thousand data sheets are being distributed in the fields of rope use—elevators, mine hoists, construction derricks, steam shovels, lumbering, etc.—for the recording of such data on discarded ropes which will be correlated with the breaking strength of these ropes.

W. H. Fulweiler, chemical engineer of the United Gas Improvement Company and a member of the A.S.M.E. Main Research Committee, is chairman of this wire rope committee.

Federal Trade Commission Resumes Utility Inquiry

THE FEDERAL TRADE COMMISSION will resume its inquiry into financial and other phases of the power and gas utility business beginning Tuesday, Sept. 29. Affairs of the Standard Gas & Electric Company, Chicago, one of the large holding companies of the Byllesby group, will be examined. Special experts employed by the commission, who have made a survey of the company's records, will testify. The hearings will be held in the commission's hearing room, 1800 Virginia Ave., N. W., Washington, D. C. The first hearing will begin at 10 o'clock.

FORD OPENS NEW ROUGE POWER PLANT



Henry and Edsel Ford and other officials of the Ford Motor Company took part in the recent opening ceremonies of the company's new River Rouge power plant, which contains the largest industrial turbine ever built—a 110,000-kw., 1,400-lb. unit designed by the General Electric Company. (See Power, Sept. 15, pp. 382-386.) Left to right are Edsel Ford; C. E. Sorensen, vice-president and general manager; Henry Ford; and A. M. Wibel, director of purchases

▼ ▼ ▼

Second Group of French Engineers Arrives Here

FOLLOWING the example set by Albert Petch, vice-president of Cie Parisienne de Distribution d' Electricité, president of Union Electricité, Lyonnaise des Eaux, Nord Lumièr, and director of Union Hydro Electrique, in sending a party of prominent French engineers to this country in 1929, a second group arrived in New York a few days ago for a tour of the large American cities. The party landed at Quebec and after visiting the work and systems of the principal electrical utility companies of Montreal, Ottawa and Toronto, is now engaged in an inspection of the leading electric utility systems of this country and the works of the leading electrical manufacturers.

Their itinerary will take them through the important eastern cities, the Pacific coast, where they will visit in San Francisco and Los Angeles before returning to the Atlantic coast via New Orleans on their way back to France.

Heading the party as president of the mission is C. G. Malegarie, president of the Cie Parisienne de Distribution d' Electricité, and with him are: G. Gouverneur, president of Société Force et Lumière Electriques; M. Bitouzet, general sales manager of Société Nord Lumière; R. Polack, general technical manager of Société Nord Lumière; J. Girard, chief engineer of Société Ouest-Lumière; G. Dessus, manager of Cie Parisienne de Distribution d' Electricité; J. Roger Vasselin, manager of

Société Ouest Lumière; P. Chapouthier, manager of the Lyonnaise des Eaux; J. Eschwege, Jr., general secretary of the Société de Distribution d'Électricité de l'Ouest; E. Dumont, president of Société Cables de Lyon; P. Viraut, general manager of the Electro Credit; and P. Boulasse, general technical secretary of the mission.

Rock Island Changes To Save $300,000

THE FEDERAL POWER COMMISSION has approved an amendment to its license of the Rock Island project of the Puget Sound Power & Light Company, now under construction on the Columbia River.

Chairman Smith explains the modification of plan as involving a relocation of the dam in its southwestern portion with consequent changes in the west spillway and the relocation of the future navigation locks from the east channel to the southwest channel, with the relocation of one fishway.

These modifications desired by the licensee are wholly satisfactory to the Federal Power Commission as well as the War and Commerce departments, it is stated. The change is believed to provide a more favorable location for the locks and thus to serve better the interests of future navigation.

A reduction of 4 ft. in the pool level has been found to make possible a saving of more than $300,000. The power company, however, assumes liability for the increase in the cost of dredging shoals in the upper reaches of the pool whenever the government adopts a navigation project involving such work. This is estimated at not more than $25,000 annually.

G. E. Lighting Institute Announces Fall Courses

TWO CONFERENCES featuring home lighting and illumination design are scheduled for the month of November at the General Electric Lighting Institute, Nela Park, Cleveland. The first conference, to be held Nov. 9 to 14, will be devoted to home lighting, and is designed to tie in with the extensive residential lighting program being launched by the National Electric Light Association.

The second conference, to be held Nov. 16-21, will consist of a general course in illumination. In addition to instruction in the design of installations for the older fields of lighting, such as store, show window, office, factory, etc., the newer fields such as aviation lighting, architectural lighting, and developments in electrical advertising will receive comprehensive treatment. Particular attention will be given to ultra-violet radiation and dual-purpose lighting. Ultra-violet for food production, light for decoration and ornament, the use of photo-electric tubes in light applications, and many other of the recent developments with which lighting specialists should be familar, will be covered.

COMING CONVENTIONS

American Society of Mechanical Engineers. Annual meeting in New York City, Nov. 30-Dec. 4. Secretary, Calvin W. Rice, 33 West 39th St., New York City.

American Institute of Electrical Engineers. District meeting at Kansas City, Mo., Oct. 22-24. Annual winter convention in New York City, Jan. 25-29, 1932. Secretary, F. L. Hutchinson, 33 West 39th St., New York.

American Society of Refrigerating Engineers. Joint meeting with the A.S.H.V.E. and annual convention at the Hotel Cleveland, Cleveland, Ohio, Jan. 26-29, 1932. Secretary, David L. Fiske, 37 West 39th St., New York City.

American Refractories Institute. Fall meeting at the Hotel Cleveland, Cleveland, Ohio, Oct. 8-9. Secretary, Dorothy A. Texter, Oliver Building, Pittsburgh, Pa.

American Water Works Association. Annual convention at the Hotel Peabody, Memphis, Tenn., May 2-6, 1932. Secretary, Beekman C. Little, 29 West 39th St., New York City.

National Association Practical Refrigerating Engineers. Annual convention and exhibition at the Municipal Auditorium, Houston, Tex., Nov. 10-13. Secretary, Edward H. Fox, 435 North Waller Ave., Chicago, Ill.

New England Water Works Association. Fiftieth annual convention at the Hotel Statler, Boston, Mass., Sept. 29-Oct. 2. Secretary, Frank J. Gifford, 715 Tremont Temple, Boston, Mass.

Third International Conference on Bituminous Coal. At Carnegie Institute of Technology, Pittsburgh, Pa., Nov. 16-21. Chairman, Thomas S. Baker, president of Carnegie Institute of Technology.

250-Mile Natural Gas Line Completed in Montana

BY THE TURNING of a control valve on the distribution system on the western outskirts of Butte, Mont., on Sept. 11, the mayor of that city marked the completion of the 250-mile pipe line and distribution system carrying natural gas from the northern Montana fields. The line was built by the Montana Power Company, which has franchises to serve many of the communities in the southwestern part of the state.

Construction of this $15,000,000 pipe line and distribution system was started last spring. It is estimated that Butte and Anaconda industries will use 10,000,000,000 cu.ft. of gas a year.

Personals

J. D. Ross completed 25 years of service as superintendent of the municipal light and power department of Seattle, Wash., last week. At the same time the department observed the 25th anniversary of its service to the city. The department was instituted by a vote of the people in 1905 with the Cedar River plant as its first unit. Since that time it has developed until its present annual income is approximately $6,000,000 and $1,500,000 of its bonded indebtedness is being retired yearly out of net earnings.

WILLIAM P. CREAGER, vice-president and chief engineer of the Northern New York Utilities Corporation, recently returned from Russia, where he has been visiting for the past year at the invitation of the Soviet government to give them the benefit of his wide experience on hydro-electric developments. Mr. Creager will speak on Russia at the first general meeting of the Engineering Society of Buffalo this fall, which will be held on Oct. 14.

PAUL A. SCHOELLKOPF, president of of the Niagara Hudson Power Corporation, has been appointed a member of the advisory committee of President Hoover's unemployment relief organization by Chairman Walter S. Gifford.

W. J. MCDONOUGH has joined the engineering staff of the Northern Equipment Company, Erie, Pa. From 1925 to 1927 Mr. McDonough was affiliated with the Northern Equipment Company as a field engineer, and since that time he has been connected with the Kissick-Fenno Company, New York City, in a sales capacity.

W. M. HERBRUCK, formerly with the engineering department of the Ohio Power Company, is now chief electrical inspector for the American Electric Switch Corporation, of Minerva, Ohio.

Obituary

A. C. LIPPINCOTT, New York district sales manager for the E. Keeler Company, of Williamsport, Pa., died on Sept. 15 at his home in East Orange, N. J. Mr. Lippincott was well known among power engineers for his inventions and investigations in the boiler field. For the past twenty years he had been associated with the New York office of the E. Keeler Company, the last fifteen of which he was manager of sales for the company in that district.

A. D. QUINN, sales manager of the industrial division of the L. H. Gilmer Company, of Philadelphia, died Sept. 17 in Chicago, while on a business trip. Mr. Quinn was born in Camden, N. J., Jan. 13, 1887. In 1919 he became associated with the Gilmer company, and in 1922 was placed in charge of the industrial division sales.

Business Notes

PENNSYLVANIA PUMP & COMPRESSOR COMPANY, Easton, Pa., has formed a connection with BYER ENGINEERING ASSOCIATES, manufacturers of condensing and cooling apparatus in Easton, with branch offices at 136 Liberty St., New York City, and 1328 Chestnut St., Philadelphia. Henry E. Byer, head of the Byer organization, has specialized for the past twenty years in the manufacture, application and operation of vacuum equipment while connected with the Ingersoll-Rand Company and the Chicago Pneumatic Tool Company.

SULLIVAN MACHINERY COMPANY, Chicago, Ill., announces the appointment of Leon J. Cone as district manager at Duluth, Minn. Mr. Cone succeeds Jonathan A. Noyes, for many years manager of the Duluth office, who has been promoted to manager of the company's coal machinery sales division, with headquarters at the general offices in Chicago.

BARBER-GREENE COMPANY, Aurora, Ill., announces the appointment as general sales manager of F. D. Hooper, formerly sales manager of the Lidgerwood Manufacturing Company, of Elizabeth, N. J. Mr. Hooper, who has had a wide experience as an engineer and sales executive, was employed by the Lackawanna Steel Company (now Bethlehem Steel) and the Boston & Maine Railroad before starting his 24 years of continuous service with the Lidgerwood company.

BAILEY METER COMPANY, Cleveland, Ohio, announces the location of sales engineers in two southern cities: M. J. McWhorter, who formerly made his headquarters at 39 Fairhaven Circle, Atlanta, Ga., is now located at 1708 Euclid Ave., Charlotte, N. C. Mr. McWhorter continues as manager of the southern territory, and is assisted by J. H. Whittlesey, who has headquarters at 3201 Carlisle Rd., Birmingham, Ala.

THE DAMPNEY COMPANY OF AMERICA, Hyde Park, Boston, Mass., announces the appointment of Clarence J. Hunter to the position of general sales manager, with headquarters at Hyde Park. Mr. Hunter was formerly manager of the Philadelphia branch office and comes to his new position with an enviable sales record, it is stated.

OTIS ELEVATOR COMPANY, New York City, has just been awarded a million dollar contract for installing elevators in the new Marshall Field office building in Chicago. This contract calls for the installation of 50 of the latest type automatic signal control elevators, and is the largest single elevator contract from a monetary standpoint ever placed in the Middle West. The de luxe elevator cabs have been designed by Graham, Anderson, Probst & White, architects for the building.

How's Business?

AFTER MENTIONING the effects on international finance of the British abandonment of a fixed gold standard, *The Business Week*, of Sept. 30, says: "In the meantime there has been no sign of tangible business improvement in this country. Our index lingers at the depression lows. Steel activity and demand are still receding, and most other indicators show less than seasonal strength. Building activity alone has increased in September, under stimulation of public and other non-residential work. It remains to be seen whether the wave of wage-cuts which have quickened investment confidence will be followed by widening markets, more investment, expanding credit and increased employment."

Production of electricity by public utilities for the week ended Sept. 19 was 1,662,660,000 kw.-hr., a decrease of 3.4 per cent below the output for the corresponding period of 1930, according to N.E.L.A. figures.

Trade Catalogs

VALVES AND SPECIALTIES — The "Lonergan Line" of power-plant specialties is described in a 92-page illustrated catalog just issued by the J. E. Lonergan Company, 211-17 Race St., Philadelphia, Pa. Among the equipment are pop safety valves, relief valves, pressure and vacuum gages, test gages, water-level gages, steam-gage syphons, gage cocks, whistles, multiple oilers and other lubricating devices.

GEARS—Catalog No. 31, recently published by the Earle Gear & Machine Company, 4707-15 Stenton Ave., Philadelphia, Pa., contains specification tables, engineering data and formulas on spur, bevel, spiral and worm gears and other gear specialities. Many illustrations are included in this handy pocket reference.

INSTRUMENTS — C. J. Tagliabue Manufacturing Company, Park and Nostrand Aves., Brooklyn, N. Y., has just issued a new general catalog (No. 1000), which describes and illustrates the complete line of "Tag" controllers, recorders, dials, thermometers, hydrometers, oil-testing instruments and moisture meters. It contains much valuable technical data, together with information on instrument applications.

PIPING—Taylor seamless steel pipe fittings for welding are described and illustrated in Bulletin 31-1 recently issued by the Taylor Forge & Pipe Works, P.O. Box 485, Chicago, Ill. Construction features, engineering data and prices of the forge fittings are included in the bulletin.

DUST COLLECTOR—The construction, operation, applications and advantages of the "Vorticose" dust collector are covered in the latest publication of Dust Recovery, Inc., 15 Park Row, New York City. Several actual installations are shown in the illustrations.

HIGH-TEMPERATURE MORTARS—General Refractories Company, 106 South 16th St., Philadelphia, Pa., has just issued an illustrated booklet describing the characteristics and applications of its high-temperature mortars and plastic chrome ore.

▼

Fuel Prices

FUEL OIL

Boston—Sept. 21, tank-car lots, f.o.b. 12@14 deg. Baumé, 2.87c. per gal.; 28@32 deg., 4.83c. per gal.

New York—Sept. 24, f.o.b. Bayonne, N. J., 28@34 deg. Baumé, industrial use, tank-car lots, 3.75c. per gal.; f.o.b. Bayway, 36@40 deg., furnace, tank-car lots, 4.75c. per gal.

Philadelphia—Sept. 19, No. 3 industrial gas oil, $1.83 per bbl.; No. 4, light industrial fuel oil, $1.31 per bbl.; No. 5, medium industrial fuel oil, $1.20 per bbl.; No. 6, heavy (Bunker C), $1.05 per bbl.

Pittsburgh—Sept. 16, f.o.b. local refinery, fuel oil, 36@40 deg., 2.875c.@3c. per gal.

Cincinnati—Sept. 22, tank-car lots, f.o.b. local refinery, 24@26 deg. Baumé, 4.5c. per gal.; 26@30 deg., 4.75c. per gal.; 30@32 deg., 5c. per gal.

Chicago—Sept. 16, tank-car lots, f.o.b. Oklahoma; freight to Chicago, 90c. per bbl. or 42 gal.; 18@22 deg., 22.5c. per bbl.; 22@24 deg., 25c. per bbl.; 24@26 deg., 27.5c. per bbl.; 26@28 deg., 32.5c. per bbl.; 28@30 deg., 37.5c. per bbl.

St. Louis—Sept. 22, tank-car lots, f.o.b. St. Louis, 24@26 deg., $1.02 per bbl., or 42 gal.; 26@28 deg., $1.095 per bbl.; 28@30 deg., $1.195 per bbl.; 30@32 deg., $1.245 per bbl.; 32@36 deg., gas oil, 2.776c. per gal.; 38@40 deg., distillate, 3.151c. per gal.

Dallas—Sept. 19, f.o.b. local refinery, 24@26 deg., 70c. per bbl. or 42 gallons.

COAL

Bituminous (Net Tons)	At Mine, for Shipment to	Price per Ton
Pool 9, super low-vol..	New York.	$1.65@$1.80
Pool 10, h. gr. low-vol..	New York	1.50@ 1.65
Pool 11, low-vol.....	New York.	1.40@ 1.50
Smokeless, mine-run...	Chicago...	1.75@ 2.00
Smokeless, slack.....	Chicago...	.40@ 1.00
Harlan, Ky., slack.....	Chicago...	.60@ .90
Franklin, Ill., mine-run	Chicago...	2.15
Franklin, Ill., screen....	Chicago...	1.10@ 1.60
Ind. 5th Vein, m.-r.....	Chicago...	1.20@ 1.75
Standard Ill., mine-run.	St. Louis..	1.25@ 1.40
W. Ky., mine-run.....	Louisville..	.85@ 1.25
W. Ky., slack.....	Louisville..	.15@ .40
Pittsburgh, mine-run...	Pittsburgh.	1.25@ 1.35
Smokeless, mine-run...	Cincinnati.	1.75@ 2.00
Smokeless, slack.....	Cincinnati.	.35@ .60
Kanawha, mine-run....	Cincinnati.	1.00@ 1.25
Kanawha, nut-slack....	Cincinnati.	.35@ .60
Anthracite (Net Tons)	At Mine, for Shipment to	Price per Ton
Buckwheat.....	New York.	$3.25
Barley.....	New York.	.90@ 1.40

NEW PLANT CONSTRUCTION

COMPILED BY THE McGRAW-HILL BUSINESS NEWS DEPARTMENT, WHICH IS PREPARED TO FURNISH A MORE COMPLETE DAILY SERVICE TO THOSE WHO WISH IT

Ark., Little Rock — Arkansas Construction Commission, J. M. Hill, Chn., will receive bids until Oct. 22 for the construction of a boiler house, smokestack and underground steam and hot water distribution system and installation of boilers and boiler room appurtenances for Farm Colony, State Hospital for Nervous Diseases, Saline County.

Ark., Siloam Springs—City, C. Harrington, Mayor, awarded contract for the construction of a 40 x 60 ft. municipal light an power plant including two 375 hp. Diesel engine units, direct connected to generator, 7 panel switchboard with all instruments, two 20 gal. storage tanks, etc., to Trans-American Co., subsidiary of McIntosh & Seymour Corp. $80,425. This corrects report in Sept. 22 issue.

Calif., Exeter—Tulare Ice Co., M. and Pine Sts., Tulare, plans the construction of an ice manufacturing plant here. Estimated cost $45,000.

D. C., Washington — Office of Architect, Capital, will receive bids until Oct. 21 for the construction of a new Supreme Court building. Estimated cost $9,000,000.

D. C., Washington—Owner c/o Epple & Kahn, 15 Washington St., Newark, N. J., Archts., is having revised preliminary plans prepared for the construction of an office building including steam heating system, etc., here. Estimated cost $3,000,000.

Ind., Fort Wayne—St. Vincents Church, awarded contract for the construction of an orphans home at Wells St. and Archer Ave. to Buesching & Hagerman, 402 East Superior St. Estimated cost $500,000.

Ia., LeMars—City defeated $325,000 bond election for construction of power plant and distribution system.

Ia., Remsen—City voted $75,000 bonds for the construction of a municipal light and power plant.

Ky., Ludlow—City plans extensions and improvements to water works including pumping equipment, softening plant and water main extensions. Estimated cost $120,000. Glazier & Morlidge, 305 Walnut St., Cincinnati, O., are engineers.

Ky., Mount Sterling—City is having plans prepared and will soon receive bids for a complete Diesel engine electric light plant. Burns & McDonnell Engineering Co., 400 Interstate Bldg., Kansas City, Mo., is engineer.

Mass., Pittsfield—Pittsfield Electric Co., C. E. Merrill, Pearl St., completing plans for a 3 story service building, office and garage at Pearl St. and Renne Ave. Estimated cost $75,000. Private plans.

Mass., Wrentham—Commonwealth of Massachusetts, Dept. of Mental Diseases, plans alterations to heating plant at State School. Estimated cost $45,000. Engineer not selected.

Mont., Great Falls—City plans addition to pump house at waterworks plant. Estimated cost $25,000. E. Henen, is city engineer.

Neb., Fremont—Board of Public Works, J. R. Henry, Chn., awarded contract for a 2,500 kw., 3,125 kva. turbo generator to General Electric Co., 610 Electric Bldg., Omaha, three pass surface condenser to C. H. Wheeler Co., 19th St. and Leigh Ave., Philadelphia, Pa., and 40 kw. motor driven exciter to Fremont Foundry & Machinery Co., Fremont, Neb. Estimated total cost $68,100.

N. J., Jersey City—Board of Commissioners, J. Wasser, Clk., City Hall, plans the construction of three laboratory buildings and two hospital buildings including steam heating system, etc., at Medical Centre. Estimated cost $5,000,000. Architect not announced.

N. J., Jersey City — Owner, c/o Christian Ziegler, 26 Journal Sq., Archt., will receive bids about Nov. 1 for the construction of a 1 story ice plant. Estimated cost $40,000.

N. J., Little Falls — Passaic Valley Water Commission, 136 Ellison St., Paterson, awarded contract for electrical apparatus including three 1,250 kva. single phase transformers for 26,400/2,400 v. service with spare and subsidiary transformers, busses and accessories; complete switchboard of 24 panels and switches, instruments and wiring; substitution of 50 small alternating motors for existing d.c. motors, complete transmission line of about 2.4 mi. in length for serving 200 hp. sub-station at 2,300 v. here to Watson & Flagg Engineering Co., 107 19th Ave., Paterson. $98,553.

N. J., Long Branch—E. C. Hazard Hospital, 81 Washington St., will receive bids about Oct. 15 for the construction of a 12 story hospital, including steam heating system, boilers, elevators, etc., at Washington Ave. and Dewey St. Estimated cost $1,000,000. C. C. Hartmann, Greensburgh, N. C., is architect.

N. Y., Brooklyn — Kings County Lighting Co., 6740 4th Ave., awarded contract for addition and alterations to gas exhauster room at First Ave. and 54th St., to E. L. Phillips, 116 East 53rd St., New York. Estimated cost to exceed $40,000.

N. Y., Middletown—Dept. of Mental Hygiene, State Office Bldg., Albany, will receive bids until Oct. 7 for refrigeration work, addition and alterations to Ashley Hall, Middletown State Hospital here.

N. Y., New York—New York Edison Co., 4 Irving Pl., plans alterations to power plant at 700 East 15th St. Estimated cost $40,000. G. H. Kress, c/o owner, is engineer.

N. C., Oteen—U. S. Veterans Bureau, c/o L. H. Tripp, Washington, D. C., awarded contract for the construction of a boiler house and chimney at U. S. Veterans Hospital here to J. M. Geary Co., Asheville, N. C. $134,000.

Oklahoma—Community Ice Co., Sulphur Springs, Tex., plans the construction of a 30 ton ice and cold storage plant at Sapulpa, also at McAlester. Estimated cost $50,000 each.

Tex., Amarillo—H. C. Badger and A. Davison, c/o Herring Hotel, will build a 1 story, 45 x 70 ft. ice plant. Estimated cost $50,000. H. M. Warren, 1012 Pierce St., is architect. Work will be done by owner's forces.

Tex., Bogata—City plans the construction of an electric light plant including distribution system, power unit, etc. Estimated cost $35,000.

Utah—Utah State National Guard, W. G. Williams, is having preliminary plans prepared for a water supply system including pumping plant, etc., at Camp W. G. Williams. Estimated cost $35,000.

Wis., Bangor—Village, E. A. Merlo, clk., awarded contract for the construction of a 60 x 90 ft. waterworks pumping plant and equipment to Nasit Bros., Co., Sparta. Estimated cost $40,000.

Wis., Green Bay—Atlas Cold Storage Warehouse Co., c/o E. R. Fisher, Pres., is receiving bids for the construction of a cold storage warehouse. Estimated cost $40,000. Private plans.

Wis., Wisconsin Rapids—City, C. P. Gross, Supt. of Water Commission, will soon award contract for the construction of an electric light plant. Estimated cost $40,000. Private plans.

Ont., Toronto — Toronto Hydro Electric System, 225 Yonge St., will build a 15 story office building including steam heating system, elevators, etc., on Carlton St. Estimated cost $1,000,000. Private plans. Excavation started by day labor. Balance of work to be done by contract.

Que., Montreal—Western Hospital, awarded contract for addition to hospital and power house at Tupper St. and Essex Ave., to Anglin-Norcross Ltd., 2063 Victoria St. Estimated cost $1,000,000.

Equipment Wanted

Boilers—Medfield, Mass.—Commonwealth of Massachusetts, Dept. of Mental Diseases, will soon receive bids for new boilers at State Hospital. Estimated cost $40,000.

Boilers—Taunton, Mass.—Commonwealth of Massachusetts, Dept. of Mental Diseases, will soon receive bids for two 350 hp. water tube boilers and stack for proposed improvements to boiler room at State Hospital. Estimated cost $40,000.

Boiler and Stoker—Cresson, Pa. — Cresson State Sanitary District, plans to purchase boiler and stoker in connection with proposed waterworks improvements.

Engine—Someville, Mass. — J. A. McCarthy, 10 Lake St., plans to purchase a six cylinder Marine engine with reverse gear.

Engine and Generator—Morganza, Pa.—Commonwealth of Pennsylvania, W. F. Penn, Supt., plans to purchase new engine and generator in connection with proposed improvements to power plant at Pennsylvania Training School.

Generating Unit—Pitcairn, Pa.—William M. Hicks, Boro Secy., Municipal Bldg., will receive bids until Oct. 2 for furnishing and erecting additional generating unit, 650 kw., 80% power factor, 3 ph., 60 cycle, 2400 v. together with direct connected exciter and necessary equipment for municipal electric light plant.

Motors, Pumps, etc.—Crown Point, Ind.—City plans to purchase two 100 kw. Diesel driven motors and two 250 g.p.m. deep well pumps for proposed improvements to light plant. Estimated cost $33,000.

Power Plant Equipment—Bedford, Hills, N. Y.—Dept. of Correction, State Capitol, Albany, N. Y., will receive bids until Oct. 22 for power plant equipment in connection with proposed group of buildings and service connections (tunnels) at New York State Reformatory for Women here.

Pump—Menomonee Falls, Wis.—City plans to purchase a 350 g.p.m. pump for proposed waterworks improvements.

Regulator — Appleton, Wis. — City c/o R. Thomas, Supt. of Public Works, will receive bids until Oct. 6 for voltage regulator for entire city current.

Regulators—Dunedin, N. Z.—City Clerk, will receive bids until Oct. 28 for supply of voltage regulators, 3,500 v. oil current breakers and metering equipment.

Sub-Station Equipment—Wellington, N. Z.—General Manager, New Zealand Government Railways, will receive bids until Nov. 17 for supply of complete equipment for three automatic substations.

Industrial Projects

Calif., Los Angeles—Los Angeles Soap Co., 617 East First St., is having plans prepared for first unit of soap factory, 2 story, 140 x 268 ft. Estimated cost $200,000. Morgan, Wells & Clements, 1135 Van Nuys Bldg., are architects. Equipment including tanks, six large steel rolling shutters, etc. will be required.

Calif., Los Angeles—Pioneer Paper Co., 5500 South Alameda St., acquired a site adjoining present plant and plans additions and extensions.

Conn., Willamantic — Corn Spinning Co., Bridge St., awarded contract for a 2 story, 60 x 100 ft. addition to textile mill on Bridge St. to Oliver L. Willard, 70 Valley St. Estimated cost $40,000.

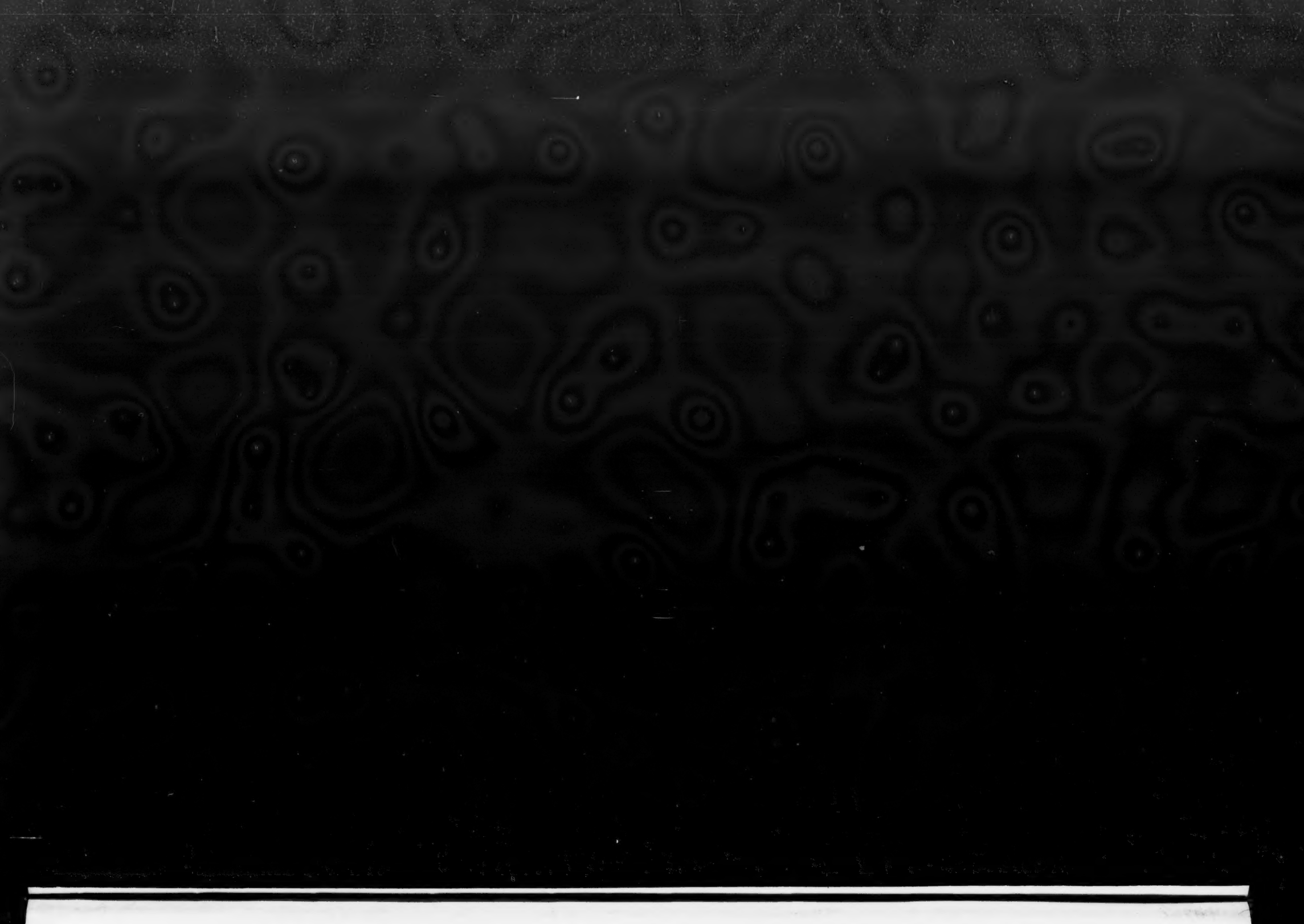
Mass., Worcester—Vellumoid Co., 54 Rochdale St., awarded contract for a 1 story, 30 x 65 ft. addition to factory to A. J. Daniels, Shrewsbury.

N. J., Fairview—F. Ebert, 510 Madison St., will build a 1 story embroidery factory at 482 Cliff St. Estimated cost $40,000. Lucht & Anderson, 432 Palisade Ave., are architects.

N. Y., Brooklyn—Reid Ice Cream Co., Waverly and Atlantic Aves., awarded contract for alterations to ice cream plant to Equity Construction Co., 25 West 43rd St., New York. Estimated cost $105,000.

Pa., Allenport—Pittsburgh Steel Co., H. D. Williams, Pres., Union Trust Bldg., Pittsburgh, plans the construction of a tube mill here. Estimated cost $1,000,000. V. Chartner, Monessen, Pa., is engineer. Work will be done by owners forces. J. D. Case, Supt., Monessen plant in charge of structural work.

Utah, Woodside—Carbon Dioxide & Chemical Co., c/o W. C. Cavenaugh, Mgr., is having preliminary plans prepared for addition to dry ice plant. Estimated cost $100,000.

Wis., Ashland—Pittsburgh & Ashland Coal & Dock Co., F. G. Hogan, Mgr., is having plans prepared for the construction of a briquette manufacturing plant. Estimated cost $100,000. R. C. Buck, Inc., 919 Tower Ave., Superior, are architects.

Ont., St. Thomas—Canadian Vitrified Products Co., awarded contract for a 1 story, 200 x 300 ft. factory here, including six oil fired kilns, etc., to Austin Co. of Canada, Permanent Bldg., Toronto. $125,000.